

SAFETY PRECAUTIONS

INSTALLATION

Be careful when working with high voltage. Contact with high voltage can result in injury or death. Never attempt repairs unless unit has been disconnected from power source. Read all instructions before operation.

Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant does not come in contact with the eyes. In case of refrigerant leaks ventilate the area immediately.

OPERATION

If, because of operating peculiarities, stop unit immediately.

Be careful when working with high voltage. Contact with high voltage can result in injury or death.

Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant does not come in contact with the eyes. In case of refrigerant leaks ventilate the area immediately.

OPERATION

Be careful when working with high voltage. Contact with high voltage can result in serious injury or death.

Wear eye goggles when repairing or servicing refrigerant system.

Never attempt repairs unless unit has been disconnected from the power supply. Do not attempt to repair a leak while system contains refrigerant. Exhaust all refrigerant from system to an outdoor area before beginning any refrigerant component repairs.

Wear rubber gloves when replacing a motor/compressor due to burnout. Acids may be present.

Keep the air conditioner vertical during shipment and/or storage.

CHANGE }
No. 8 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. , 5 February 1979

**Operator, Organizational, Direct Support,
General Support and Depot Maintenance Manual**

**AIR CONDITIONER, VERTICAL, COMPACT, 208 VOLTS, AC, 400
HERTZ, THREE PHASE, 18,000 BTU/HR COOLING, 12,000
BTU/HR HEATING, KECO MODEL F18T-4-2
NSN 4120-00-168-1775, HARVEY
W. HOTTEL MODEL CV-20-4-08,
NSN 4120-00-152-1150**

TM 5-4120-307-15, 19 February 1970, is changed as follows:

Page ii. Table of Contents, delete (NOT APPLICABLE) from Appendix B and C.

Page 1-1. Add paragraph 1-2.1 as follows:

1-2.1. HAND RECEIPT

Hand receipts for Basic Issue Items (BII) and Additional Authorized List (AAL) items are published in a Hand Receipt Manual. The Hand Receipt Manual numerical designation is the same as the related Technical Manual with the letters

HR added to the number. These manuals are published to aid in property accountability and are available through: Commander, US Army Adjutant General Publication Center, ATTN: AGDL-OD, 1655 Woodson Road, St. Louis, Mo 63114.

Page B-1. Appendix B is added as follows:

**APPENDIX B
COMPONENTS OF END ITEMS LIST
SECTION I. INTRODUCTION**

1. SCOPE

This appendix lists Integral Components of and Basic Issue Items (BII) for the Air Conditioner to help you inventory items required for safe and efficient operation.

2. GENERAL

The components of end item list are divided into the following sections:

a. Section II. Integral Components of the End Item. NOT APPLICABLE.

b. Section III. Basic Issue Items. These are minimum essential items required to place the Air Conditioner in operation, to operate it and to perform emergency repairs. Although shipped separately packed, they must accompany the Air Conditioner during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement BII based on Table(s) of Organization and Equipment (TOE)/Modification Table of Organization and Equipment (MTOE) authorization of the end item.

3. EXPLANATION OF COLUMNS.

a. Illustration: This column is divided as follows:

(1) *Figure Number.* Indicates the figure number of the illustration on which the item is shown (if applicable).

(2) *Item Number.* The number used to identify item called out in the illustration.

b. National Stock Number (NSN): Indicates the national stock number assigned to the end item which will be used for requisitioning.

c. Part Number (P/N): Indicates the primary number used by the manufacturer which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards and inspection requirements to identify an item or range of items.

d. Description: Indicates the federal item name and, if required, a minimum description to identify an item.

e. Location: The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. Usable on Code: "USABLE ON" codes are included to help you identify which component items are used on the different models. Identification of the codes used in this list are: CODE USED ON

g. Quantity Required (Qty Reqd): This column lists the quantity of each item required for a complete major item.

h. Quantity: This column is left blank for use during inventory. Under the received column, list the quantity you actually receive on your major item. The date columns are for use when you inventory the major item at a later date, such as for shipment to another site.

Section II. INTEGRAL COMPONENTS OF THE END ITEM

(Not Applicable)

Section III. BASIC ISSUE ITEMS

(1)		(2)	(3)	(4)	(5)	(6)	(7)
ILLUSTRATION		NATIONAL STOCK NUMBER	PART NO & FSCM	DESCRIPTION	LOCATION	USABLE ON CODE	QTY REQD
(a)	(b)						
FIGURE NO	ITEM NO						
		7520-00-559-9618		CASE: Maintenance and operation Manual, TM 5-4120- 307-15		EA	1

Page C-1. Appendix C is added as follows:

APPENDIX C
ADDITIONAL AUTHORIZATION LIST
Section I. INTRODUCTION

1. SCOPE.

This appendix lists additional items you are authorized for the support of the Air Conditioner.

2. GENERAL.

This list identifies items that do not have to accompany the Air Conditioner and that do not have to be turned in with it. These items are authorized to you by CTA, MTOE, TDA or JTA.

3. EXPLANATION OF LISTING.

National stock number, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment.

Section II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION		(3)	(4)
	PART NUMBER & FSCM	USABLE ON CODE	U/M	QTY AUTH
4130-00-550-2995	BLOCKOFF PANEL	13215E9885 (97403)	EA	1
5935-00-846-2328	RECEPTACLE, ELECTRICAL	MS3106R22-22-S (C) (96909)	EA	1
4130-00-456-9801	SOUND ATTENUATOR	13211E3798 (97403)	EA	1

TM 5-4120-307-15
C8

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

DA Form 12-25C, Operator maintenance
100 BTU.

CHANGE }
No. 8 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. , 5 February 1979

**Operator, Organizational, Direct Support,
General Support and Depot Maintenance Manual**

**AIR CONDITIONER, VERTICAL, COMPACT, 208 VOLTS, AC, 400
HERTZ, THREE PHASE, 18,000 BTU/HR COOLING, 12,000
BTU/HR HEATING, KECO MODEL F18T-4-2
NSN 4120-00-168-1775, HARVEY
W. HOTTEL MODEL CV-20-4-08,
NSN 4120-00-152-1150**

TM 5-4120-307-15, 19 February 1970, is changed as follows:

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The components of end item list are divided into the following sections:

a. Section II. Integral Components of the End Item. NOT APPLICABLE.

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3. EXPLANATION OF COLUMNS.

a. Illustration: This column is divided as follows:

(1) *Figure Number.* Indicates the figure number of the illustration on which the item is shown (if applicable).

(2) *Item Number.* The number used to identify item called out in the illustration.

b. National Stock Number (NSN): Indicates the national stock number assigned to the end item which will be used for requisitioning.

c. Part Number (P/N): Indicates the primary number used by the manufacturer which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards and inspection requirements to identify an item or range of items.

d. Description: Indicates the federal item name and, if required, a minimum description to identify an item.

e. Location: The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. Usable on Code: "USABLE ON" codes are included to help you identify which component items are used on the different models. Identification of the codes used in this list are: CODE USED ON

g. Quantity Required (Qty Req'd): This column lists the quantity of each item required for a complete major item.

h. Quantity: This column is left blank for use during inventory. Under the received column, list the quantity you actually receive on your major item. The date columns are for use when you inventory the major item at a later date, such as for shipment to another site.

Section II. INTEGRAL COMPONENTS OF THE END ITEM

(Not Applicable)

Section III. BASIC ISSUE ITEMS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)
(a) FIGURE NO	(b) ITEM NO	NATIONAL STOCK NUMBER	PART NO. & FSCM	DESCRIPTION	LOCATION	USABLE ON CODE	QTY REQD
		7520-00-559-9618		CASE: Maintenance and operation Manual, TM 5-4120- 307-15		EA	1

Page C-1. Appendix C is added as follows:

APPENDIX C
ADDITIONAL AUTHORIZATION LIST
Section I. INTRODUCTION

1. SCOPE.

This appendix lists additional items you are authorized for the support of the Air Conditioner.

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This list identifies items that do not have to accompany the Air Conditioner and that do not have to be turned in with it. These items are authorized to you by CTA, MTOE, TDA or JTA.

3. EXPLANATION OF LISTING.

National stock number, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment.

Section II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION	(3) USABLE ON CODE	(3) U/M	(4) QTY AUTH
4130-00-550-2995	BLOCKOFF PANEL	13215E9885 (97403)	EA	1
5935-00-846-2328	RECEPTACLE, ELECTRICAL	MS3106R22-22-S (C) (96909)	EA	1
4130-00-456-9801	SOUND ATTENUATOR	13211E3798 (97403)	EA	1

TM 5-4120-307-15
C8

By *ler of the Secretary of the Army:*

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25C, Operator maintenance requirements for Air Conditioners: 18,000 BTU.

Changes in force: C1, C2, C3, C4, C5, C6 and C7

**TM 5-4120-307-15
C7**

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**HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D, C, 24 February 1978**

**Operator, Organizational, Direct Support, General Support,
and Depot Maintenance Manual**

**AIR CONDITIONER, VERTICAL: COMPACT; 208 VOLT AC, 400 HERTZ,
THREE PHASE; 18,000 BTU/HR COOLING, 12,000 BTU/HR
HEATING (KECO MODEL) F18T4-2
NSN 4120-00-168-1775**

M 5-4120-307-15, 19 February 1970, is changed as follows:

PPENDIX C, Section II. MAINTENANCE ALLOCATION CHART is superseded as follows:

Section II. MAINTENANCE ALLOCATION CHART

(1)	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
	FRAME													
01	Frame assembly													
	Base assembly	O							F					
	Casing assembly	O							F					
	Guard, condenser fan	O							O					
	Screen, drain, base	O							O					
	BODY, CAB, HOOD AND HULL													
01	Panels													
	Baffle	O							F					
	Chain & damper control	O							O					
	Cover assemblies	O							O					
	Damper assembly	O							F					
	Grilles	O							O					
	Panel assembly, front													
	lower	O							O					
	Panels, back & top	O							F					
	Retainer assembly, filter	O							O					
	Sound attenuator & paulin	O						O	O					
	BODY, CHASSIS OR HULL AND ACCESSORY ITEMS													
	Accessory items													
	Connection assembly, remote control	O						O	O					
	Winterization equipment													
	Heater, electrical	O	O						O					
	ELECTRIC MOTORS													
	Motor assembly	C	O	C					O	F				
	Mount bushing	O							O					
	Motor assembly, fan	O	O						O	F				
	Bearing	F							F					
	Rotor assemblies													
	Rotor, fan motor	F							F					
	Stator assemblies													
	Stator, fan motor	F	F						F					
	Frame, supports & housings													
	Cover, stator housing	F							F					
	Endbell, housing	F							F					
	Housing, stator	F							F					

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
40														
4006	Starting & protective devices													
	Protector overload -----		O						O					
	Relay, phase -----		O						O					
4009	Control panels, housing cubicles													
	Box, control -----		O						O					
	Connector, receptacle -----		O						O					
	Control panel assembly -----		O						O	O				
	Leads, electrical -----		O						O					
	Receptacle -----		O						O					
4010	Master or auxiliary control assembly													
	Contact, electrical -----		O						O					
4011	Circuit breakers													
	Circuit breakers, compressor -----		O						O					
	Fuse -----		O						O					
4012	Switches													
	Switch, rotary -----		O						O					
	Switch, pressure -----													
	Hi & Lo -----		F						F					
	Switch, thermostatic -----		O						O					
	Switch, fan speed -----		O						O					
	Switch, pressure, fan speed -----		F						F					
4017	Transformer: Rectifier													
	Rectifier -----		O						O					
	Transformer -----		O						O					
4018	Terminal blocks													
	Connector, receptacle -----		O						O					
	Terminal blocks -----		O						O					
4214	Radio interference suppression filter, RFI -----		O						O					
47	GAGES													
4702	Gages													
	Sight glass -----	O							F					
52	REFRIGERATION & AIR CONDITIONING COMPONENTS													
5200	Gas compressor assembly -----		F	F					F					A
	Compressor assembly -----	F	F	F					F					
	Mount, resilient -----	O							F					
5217	Refrigerant piping													
	Valve, check -----		F						F					
	Tubing, cooper -----		F						F					
	Valve, pressure relief -----		F						F					
	Valve, regulating -----		F		F				F					
	Valve, service -----		F						F	F				
	Valve, solenoid -----		F						F	F				B
	Tank, surge -----								F					
	Valve, thermostatic bypass -----				F				F					

(1)	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
10	Condenser													
	Subcooler								F					
	Condenser assembly		F	C					F					C
	Receiver								F					
6	Hydrating equipment													
	Dehydrator								F					
1	Evaporator													
	Evaporator assembly		F	C					F					D
	Tube, drain		O		F				F					
	Valve, expansion		F		F				F					
1	Fan assembly													
	Fan	O							O					
1	Thermostatic controls													
	Switch, thermostat													
	temperature regulating	O							O					
	Air filters													
	Filters	C		C					C					

er of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

J. C. PENNINGTON
Brigadier General, United States Army
The Adjutant General

ution:

distributed in accordance with DA Form 12-25C, Operator maintenance require-
or Air Conditioners: 18,000 BTU, Compact.

CHANGE

No. 6

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 22 February 1977

**Operator's Organizational, Direct Support,
General Support and Depot Maintenance Manual
AIR CONDITIONER, VERTICAL, COMPACT, 208 VOLTS, AC, 400
HERTZ, THREE PHASE, 18,000 BTU/HR COOLING, 12,000
BTU/HR HEATING, KECO MODEL F18T-4-2
NSN 4120-00-168-1775, HARVEY
W. HOTTEL MODEL CV-20-4-08,
NSN 4120-00-152-1150**

TM 5-4120-307-15, 19 February 1970, is changed as follows:

Page ii. Table of Contents Change the title of Appendix B and C to read.

APPENDIX B. COMPONENTS OF END ITEM LIST (Not applicable)

C. ADDITIONAL AUTHORIZATION LIST (Not applicable)

Appendix D and E are added as follows.

APPENDIX D. MAINTENANCE ALLOCATION CHART

E. EXPENDABLE SUPPLIES AND MATERIALS LIST

Page 1-1, paragraph 1-2c. is superseded as follows:

c. You can help improve this manual by calling attention to errors and by recommending improvements. You will find several copies of DA Form 2028-2 (Recommended Changes to Equipment Technical Manuals) in the back of this change. There is also a sample of DA Form 2028-2 properly completed. If these have already been used, you may submit your ideas on DA Form 2028 or in a letter. Mail DA Form 2028, or your letter to: Commander, US Army Troop Support Command, ATTN: DRSTS-MPP, 4300 Goodfellow Boulevard, St. Louis, MO 63120. A reply will be furnished direct to you.

Page 3-1. Paragraph 3-5 is superseded as follows:

3-5. General

To insure that the Air Conditioner is ready for operation at all times, it must be inspected systematically so that the defects may be discovered and corrected before they result in serious damage or failure. Defects discovered during operation of the unit shall be noted for future corrections, to be made as soon as an operation has ceased. Stop operation which would damage the equipment if operation

were to continue. All deficiencies and shortcomings shall be recorded together with the corrective action taken on DA Form 2404, (Equipment Inspection and Maintenance Worksheet), at the earliest opportunity. When performing your "Before Operation" (B) and "During Operation" (D) PMCS, always keep in mind the CAUTIONS and WARNINGS. After operation, be sure to perform your (A) PMCS. If your equipment fails to operate, troubleshoot with proper equipment. Report any deficiencies using the proper forms, see TM 38-750.

Paragraph 3-6 is superseded as follows:

3-6. Preventive Maintenance Checks and Services

Refer to tables 3-1, 3-1.1 and figures 3-1 through 3-4 for Preventive Maintenance Checks and Services.

a. *Item Number Column.* Checks and services are numbered in chronological order regardless of interval. This column will be used as a source of item numbers for the ↓↓TM Item Number↑↑ column on DA Form 2404 in recording results of PMCS.

b. *Interval Columns.* The columns headed "B", "D", "A", "W", and "M", will contain a dot (.) opposite the appropriate check indication it is to be performed Before, During, After, Weekly or Monthly.

c. *Combat Operability Column.* A dot (.) in the "C" column will identify combat operability check for unit readiness reporting purposes.

d. *Item To Be Inspected Column.* The items listed in this column are divided into groups and identifies the items to be inspected.

e. *Procedures Column.* This column contains a brief description of the procedures by which the check is to be performed

f. *Equipment Will Be Reported Not Ready (RED) Column.* This column will contain the criteria which will cause the equipment to be classified as not ready

ED) because of inability to perform its primary mission.

NOTE

If the equipment must be kept in continuous operation, check and service only those

items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shutdown.

Page 3-6. Table 3-1 is superseded as follows:

Table 3-1. Operator Crew Preventive Maintenance Checks and Services

NOTE: Within designated interval, these checks are to be performed in the order list.

Item No.	Interval					C	Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment will be reported Not Ready (Red) if:
	B	D	A	W	M				
1		•				•	Unit	Check for any unusual noises or vibration and report an unacceptable condition to Direct Support Maintenance	Unusual noise, or vibration is determined
2		•				•	Sight Glass	Check for condition of Refrigerant Charge. Operate unit for 30 minutes and check appearance of refrigerant in Sight Glass. If refrigerant contains bubbles, or appears milky, report condition to Direct Support Maintenance.	Refrigerant contains bubbles, or appears milky

Page 3-6. Table 3-1.1 is added as follows.

Table 3-1.1. Organizational Preventive Maintenance Checks and Services

W — Weekly
M — Monthly

Q — Quarterly
S — Semiannually

A — Annually
B — Biennially

H — Hours
MI — Miles

Interval								Item To Be Inspected	Procedures	Equipment Will Be Reported Not Ready (Red) If:
W	M	Q	S	A	B	H	MI			
								Air Filter and Mist Eliminator	Inspect for accumulation of dirt.	Filter and mist eliminator dirty
								<p>WARNING</p> <p>Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Use in a well ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F. — 138°F. (38°C. — 59°C.). Wash filter and mist eliminator using dry cleaning solvent, Federal Specification P-D-680. Dry with a clean dry cloth. Dip or spray filter with Oil, Specification OE/HDO MIL-L-2104.</p>		

e B-1. Appendix B not applicable.

e C-1. Appendix C not applicable.

e D-1. Appendix D is added as follows.

APPENDIX D

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

D-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component and the work measurement time required to perform the functions by the designated maintenance level. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions or explanatory notes for a particular maintenance function.

D-2. Explanation of Columns in Section II

a. *Group Number, Column (1).* A number is assigned to each group in a top-down breakdown sequence. The applicable groups are listed in the MAC in disassembly sequence beginning with the first group removed.

b. *Assembly Group, Column (2).* This column contains a brief description of the components of each numerical group.

c. *Maintenance Functions, Column (3).* This column lists the functions to be performed on the items listed in Column 2. The lowest maintenance level authorized to perform these functions is indicated by a symbol in the appropriate column. The symbol designators for the various maintenance levels are as follows:

- C — Operator or crew.
- O — Organizational maintenance.
- F — Direct Support maintenance.
- H — General Support maintenance.
- D — Depot Maintenance.

The maintenance functions are defined as follows:

(1) *Inspect.* To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards through examination.

(2) *Test.* To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

(3) *Service.* Operations required periodically to keep an item in proper operating condition, i.e., to clean, to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air

supplies.

(4) *Adjust.* To maintain within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

(5) *Align.* To adjust specified variable elements of an item to bring about optimum or desired performance.

(6) *Calibrate.* To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

(7) *Install.* The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

(8) *Replace.* The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

(9) *Repair.* The application of maintenance services (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

(10) *Overhaul.* That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to a like-new condition.

(11) *Rebuild.* Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipments/components.

d. *Maintenance Level, Column (4).* This column is made up of subcolumns for each category of maintenance. Work time figures are listed in these subcolumns for the lowest level of maintenance

authorized to perform the function listed in Column 3. These figures (shown directly below the symbol) indicate the average active time required to perform a maintenance function at the indicated category maintenance under typical field operating conditions.

a. Tools and Equipment, Column (5). This column is provided for referencing by code, the special tools and test equipment (Sec. III) required to perform the maintenance functions (Sec. II).

f. Remarks, Column (6). This column shall contain letter code in alphabetic order which shall be keyed to the remarks contained in Section IV.

3. Explanation of Columns in Section III

a. Reference Code. This column consists of an alphabetic number listed in sequence from column (5) of section II. The number references the special tools and test equipment requirements.

b. Maintenance Level. This column shows the lowest level of maintenance authorized to use the special tools or test equipment.

c. Nomenclature. This column lists the name or identification of the tools or test equipment.

d. National/NATO Stock Number. This column is provided for the NSN of special tools and test equipment listed in the nomenclature column.

e. Tool Number. This column lists the manufacturer's code and part number of tools and test equipment.

D-4. Explanation of Columns in Section IV

a. Reference Code. This column consists of a letter code in alphabetic order which is keyed to column 6 of section II.

b. Remarks. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, section II.

Section II. MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance level					(5) Tools and equipment	(6) Remarks
			C	O	F	H	D		
1	FRAME:								
	Panel, Bottom Base	Inspect		0.2					
		Replace				8.0			
	Casing Assembly	Inspect		0.3					
		Replace				6.0			
	Condenser Fan Guard	Inspect		0.1					
2		Replace		0.3					
	BODY, CAB, HOOD AND HULL:								
	Panels Baffle, Fan	Inspect		0.1					
		Replace		1.0					
	Chain & Damper Control	Inspect		0.2					
		Replace		4.0					
	Cover Assemblies	Inspect		0.2					
		Replace		0.3					
	Damper Assembly	Inspect		0.2					
		Replace			4.0				
	Grilles	Inspect		0.2					
		Replace		0.3					
	Panel Assembly, Front Lower	Inspect		0.1					
		Replace		0.2					
	Panels, Back & Top Retainer Assembly								
	Filter	Inspect		0.1					
		Replace		1.0					
	Sound Attenuator & Puhin	Inspect		0.5					
		Install		1.0					
3	BODY, CHASSIS OR HULL AND ACCESSORY ITEMS:								
	Winterization								
	Equipment Heater								
	Electrical	Inspect		0.5					
		Test		0.4				1	A
		Replace		1.0					

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance level					(5) Tools and equipment	(6) Remarks
			C	O	F	H	D		
04	ELECTRIC MOTORS:								
	Motor Assembly	Inspect	0.5						
		Test		1.0				1	A
		Service	0.5						
		Replace		2					
		Repair			1.0				
	Mount, Resilient	Inspect		0.5					
		Replace		1.0					
	Motor Assembly, Fan								
	Bearing	Inspect			2.0				
		Replace			1.0				
	Rotor Assemblies								
	Rotor, Fan Motor	Inspect			1.0				
		Replace			1.0				
	Stator Assemblies								
	Stator, Fan Motor	Inspect			1.0				
		Test			1.0			1	A
		Replace			1.0				
	Frame, Supports & Housings:								
	Cover, Stator								
	Housing	Inspect			2.0				
		Replace			1.0				
	End Bell Housing	Inspect			0.5				
		Replace			0.5				
	Housing, Stator	Inspect			0.5				
		Replace			2.0				
	Starting & Protective Devices								
	Protective Overload, Thermal	Test		1.0				1	A
		Replace		1.0					
	Relay, Phase	Test		0.3				1	A
		Replace		0.5					
	Control Panels, Housing Cubicles								
	Box, Control	Test		1.0				1	A
		Replace		1.0					
	Control Panel Assembly	Test		0.5				1	A
		Replace		1.0					
		Repair		1.0					
	Wiring Harness	Test		0.2				1	A
		Replace		0.5					
	Power, Receptacle, Connector	Test		0.3				1	A
		Replace		1.0					
	Master or Auxiliary Control Assembly								
	Relay, Electrical	Test		0.5				1	A
		Replace		1.0					
	Circuit Breakers & Circuit Breakers, Compressor	Test		0.5				1	A
		Replace		0.5					
	Fuse	Test		0.2				1	A
		Replace		0.3					
	Switches:								
	Switch, Rotary	Test		0.3				1	A
		Replace		1.0					
	Switch, Pressure Hi & Low	Test			0.3			1	A
		Replace			1.0				

1) eqp no- br	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance level					(5) Tools and equip- ment	(6) Remarks
			C	O	F	H	D		
cont)	Switch, Heater, Cutout, High Temperature	Test Replace		0.3 1.0				1	A
	Switch, Fan Speed, Toggle, Switch, Pressure, Fan Speed	Test Replace			0.3 1.0			1	A
	Transformer: Rectifier	Test Replace		0.5 0.5				1	A
	Transformer	Test Replace		0.5 0.5				1	A
	Terminal Blocks Connector, Receptacle	Test Replace		0.2 0.2				1	A
	Radio Interference Suppression Filter, (RFT)	Test Replace		0.4 1.0				1	A
	GAGES: Sight Glass	Inspect Replace		0.3		3.0			
	REFRIGERATION & AIR CONDITIONING COMPONENTS: Gas Compressor Assembly	Test Service Replace			0.5 0.5			2	B C
	Compressor Assembly	Inspect Test Service Replace			0.5 0.5 0.5	10			
	Mount, Resilient	Inspect Replace		0.5		10			
	Refrigerant Piping Valve, Check	Test Replace			0.4 1.0	1.0			
	Tubing, Copper	Test Replace			0.5 4.0				
	Valve, Pressure Relief	Test Replace			0.5 4.0				
	Valve, Regulating	Test Adjust Replace			0.5 1.0 4.0				
	Valve, Service	Test Replace Repair			0.5 4.0 1.0				
	Valve, Solenoid	Test Replace Repair			0.5 4.0 1.0			1	
	Tank, Surge Valve, Thermostatic Bypass	Replace Adjust Replace			1.0 0.3 1.0				
	Condenser: Subcooler	Test Service Replace	1.0		0.5 5.0				

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance level					(5) Tools and equipment	(6) Remarks
			C	O	F	H	D		
86 (cont.)	Receiver	Repair			5.0				F
	Hydrating Equipment								
	Dehydrator	Replace			4.0				
	Evaporator:								
	Evaporator Assembly	Test			0.5				G
		Service							
		Replace			5.0				
	Tube, Drain,								
	Condensate	Service		0.5					H
		Replace		1.0					
	Valve, Expansion	Test		1.0					
		Adjust		1.0					
		Replace		3.0					
	Fan Assembly: Fan	Inspect		0.5					
		Replace		2.0					
	Thermostatic								
	Controls Switch,								
	Thermostat								
	Temperature								
	Regulating	Inspect		0.3					
		Replace		1.0					
	Air Filters:								
	Filters	Inspect	0.3						
		Service	1.0						
		Replace	0.5						I

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

(1)	(2)	(3)	(4)	(5)
Reference Code	Maintenance category	Nomenclature	National stock number (NSN)	Tool number
1	O	Multimeter	6625-00-553-0142	TS-352 B/U
2	F	Leak Detector, Refrigerant	4940-00-531-0362	

Section IV. REMARKS

Reference code	Remarks
A	DS will test the Hi and Low pressure switch, fan speed switch, toggle switch, and solenoid valve; all other electrical tests will be done at organizational level.
B	DS will test for leaks, and proper operating pressure. Testing includes the use of Refrigerant Leak Detector, or soap and water solution.
C	DS will service the unit by checking the oil level, and add lubricating oil (Ref. V-V-L-825, NSN 9150-00-823-7905), and adding (Refrigerant -22), when required.
	WARNING
	Dry cleaning solvent, P-D-680 used to clean parts is potentially dangerous to personnel and property. Use in a well ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F. -138°F.(38°C. -59°C.).
D	DS will clean the solenoid valve using dry cleaning solvent P-D-680 and dry thoroughly with a clean dry cloth.
D-D	Repair of solenoid valves limited to replacement of coil only.
E	DS will clean coil, using a brush, and a damp rag saturated with dry cleaning solvent P-D-680.
F	DS will clean the received when replacing, using dry cleaning solvent P-D-680 and dry thoroughly with a clean dry cloth. Apply filter sealing.
G	Clean the evaporator assembly using dry cleaning solvent, Federal Specification P-D-680, dry thoroughly using a clean dry cloth.
H	Clean condensate drain tube to include evaporator drain pan and upper drain line.
I	Clean filters with dry cleaning solvent P-D-680 and dry thoroughly with a clean dry cloth.

APPENDIX E EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

E-1. Scope

This appendix lists Expendable Supplies and Materials you will need to operate and maintain the Air Conditioner. These items are authorized to you by CTA50-970, Expendable Items (except Medical, Class V, Repair Parts and Heraldic Items).

E-2. Explanation of Columns

a. *Column 1 - Item Number.* This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material.

b. *Column 2 - Level.* This column identifies the lowest level of maintenance that requires the listed item.

c. *Column 3 - National Stock Number.* This is the national stock number assigned to the item; use it to request or requisition the item.

d. *Column 4 - Description.* Indicates the federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parenthesis, if applicable.

e. *Column 5 - Unit of Measure (U/M).* Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., each(ea), inch(in), pair(pr), etc.). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item number	(2) Level	(3) National stock number	(4) Description	(5) U/M
1	F	9150-00-823-7905	Lub. Oil Ref. VV-L-825	
2	C	6850-00-264-9037	Dry Cleaning Solvent P-D-680 (81348)	GL
3	F	6830-00-837-9927	Monochlorodifluoromethane, Technical: w/cylinder 22 lb. (Refrigerant - 22) BB-F-1421, type 22 (81348)	GL CY

By Order of the Secretary of the Army:

Official:

PAUL T. SMITH
Major General, United States Army
The Adjutant General

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Distribution:

To be distributed in accordance with DA Form 12-25C, Operator maintenance requirements for Environmental Equipment Air Conditioners, 18,000 BTU, Compact.



SOMETHING WRONG WITH THIS MANUAL?

THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)

PFC JOHN DOE
COA, 3rd ENGINEER BN
FT. LEONARD WOOD MO 63108

DATE 16 DEC 74

PUBLICATION NUMBER

TM5-6115-200-20 AND P

DATE

1 APR 72

TITLE

GENERATOR SET 10 KW
NSN 6115-00-231-7286

BE EXACT... PIN-POINT WHERE IT IS

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.
----------	------------	------------	-----------

6

2-1
a

In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders

81

4-3

Callout ^D16 on figure 4-3 is pointing at a bolt. In the key to fig. 4-3, item 16 is called a shim. Please correct one or the other.

125

line 20

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered so the NSN is wrong. Please give me a good NSN

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

JOHN DOE, PFC (268) 317-7111

SIGN HERE:

John Doe

DA

FORM

2028-2 (TEST)

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PARA-
GRAPH

FIGURE
NO.

TABLE
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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS



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PAGE
NO.

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GRAPH

FIGURE
NO.

TABLE
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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

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BE EXACT... PIN-POINT WHERE IT IS

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PAGE
NO.

PARA-
GRAPH

FIGURE
NO.

TABLE
NO.

TEAR ALONG DOTTED LINE

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE:

DA FORM 2028-2 (TEST)

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FOLD BACK

TM 5-4120-307-15
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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 7 March 1975

**Operator's Organizational, Direct Support,
General Support and Depot Maintenance Manual**

**AIR CONDITIONER, VERTICAL, COMPACT, 208 VOLTS, AC, 400
HERTZ, THREE PHASE, 18,000 BTU/HR COOLING, 12,000
BTU/HR HEATING, HARVEY W. HOTTEL MODEL CV-20-4-08,
NSN 4120-00-152-1150, KECO MODEL F18T4-2
NSN 4120-00-168-1775**

M 5-4120-307-15, 19 February 1970, is changed as follows:

the title is changed as shown above.

page 2 of Cover. Add the following warning to the list of safety precautions.

WARNING

The burning of polyurethane foams is dangerous. Due to the chemical composition of a polyurethane foam, toxic fumes are released when it is burned or heated. If it is burned or heated indoors, such as during a welding operation in its proximity, precautions should be taken to adequately ventilate the area. An exhaust system equivalent to that of a paint spray booth should be used. Air supplied respirators, approved by the National Institute for Occupational Safety & Health or the U.S. Bureau of Mines, should be used for all welding in confined spaces and when ventilation is inadequate. Individuals who have chronic or recurrent respiratory conditions, including allergies and asthma, should not be employed in this type of environment.

by Order of the Secretary of the Army:

FRED C. WEYAND
*General, United States Army
Chief of Staff*

Official:

VERNE L. BOWERS
*Major General, United States Army
The Adjutant General*

Distribution:

To be distributed in accordance with DA Form 12-25C, (qty rqr block no. 541) Operator maintenance requirements for Environmental Equipment Air Conditioners, 18,000 BTU, Compact.

TM 5-4120-307-15

C4

Change }
No. 4 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC 15 June 1973

**Operator, Organizational, Direct Support, General
Support and Depot Maintenance Manual
AIR CONDITIONER, VERTICAL: COMPACT; 208 VOLTS, AC, 400 HERTZ, THREE PHASE;
18,000 BTU/HR COOLING, 12,000 BTU/HR HEATING (HARVEY W. HOTTEL MODEL
CV-20-4-08) FSN 4120-152-1150, (KECO MODEL F18T4-2) FSN 4120-168-1775.**

TM 5-4120-307-15, 19 February 1970, is changed as follows:

Page 2-1. Paragraph 2-3c, line 3. The third sentence is superseded as follows:

Remove drain plugs from 3 outside drain connections (fig. 1-1). Since the drain plug on the front side of unit (evaporator and control panel side) is normally on the inside of the van or inclosure to be air conditioned, no drain hose is to be connected to this drain connection. Install drain hose assembly kit by installing drain elbows in each drain connection and attach 5/16 inch I.D. drain lines to each elbow. Tilt top of unit 5 degrees toward rear drain hose. Manifold the drain lines to a single four foot long drain hose. Periodic cleaning of these drain hoses and drain traps inside unit may be required.

Page 6-2. Paragraph 6-4k.1, (C 3), line 2, refrigerant charge is changed to read 5 lbs

Page 7-4. Paragraph 7-4e4 1(C 3), Lines 5 and 6 and line 2 of Caution "4(four) lbs" is changed to read "5(five) lbs".

Page 7-9. Paragraph 7-11f is superseded as follows:

f. Installation.

- (1) Install three (3) resistors to terminals on

rotary switch, (29 figs. 7-5 and 7-5.1). Install one resistor with two insulation sleeves between terminals 32 and 3A. See figure 1-4, item S-1. Bring resistor wire around back at base of terminals and loop wire around terminal lugs to front. Solder to front of terminals, using rosin core solder, as shown in figure 1-4 and figure 7-5.1. Be careful to apply solder to base of terminals only so as not to interfere with spade lugs which slip on the top part of terminals.

NOTE

No solder is required on back of terminal lugs. Use care not to solder spade lugs to terminals.

(2) Install remaining two (2) resistors to rotary switch in same manner; one between terminals 42 and 4A; and one between terminals 41 and 4C as shown in figure 1-4, C4, Item S-I.

(3) Reassembly shall be in reverse order of disassembly. Make sure all tagged wires are connected to the parts to which they belong.

Figure 7-5.1 is added as follows:

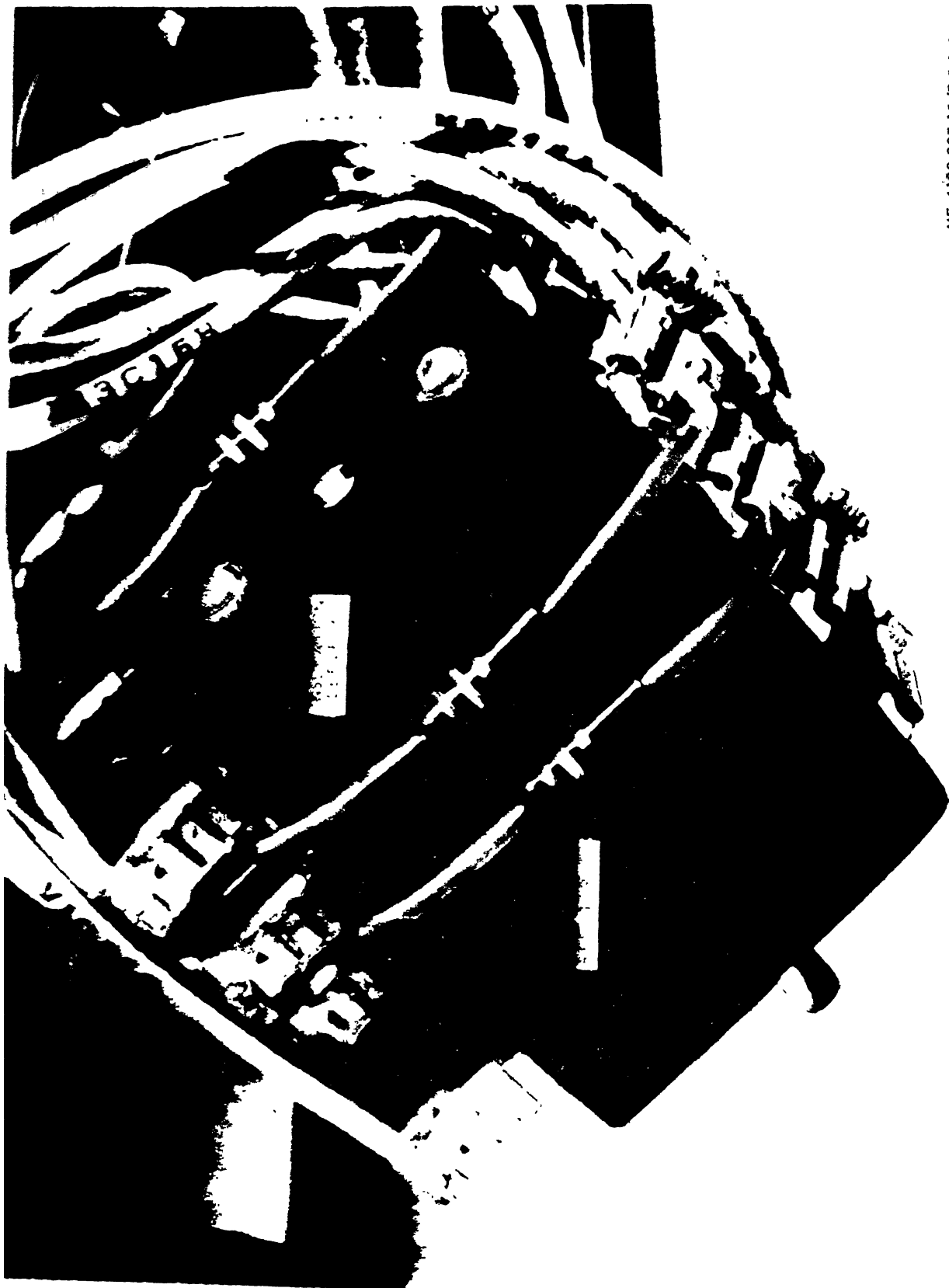


Figure 1-1 Installation of main frame

ME 4 120-307-15 7-5-1 C4

page 7-24, paragraph 7-22. After line 12 add the following: Allow unit to operate one hour before

checking sight gage for moisture content and refrigerant shortage.

Page B-1. Appendix B is superseded as follows:

APPENDIX B BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

1-1. Scope

This appendix lists items required by the operator or operation of the air conditioner.

1-2. General

This list is divided into the following sections:

a. *Basic Issue Items List - Section II.* Not applicable.

b. *Items Troop Installed or Authorized List—Section III.* A list of items in alphabetical sequence, which at the discretion of the unit commander may accompany the air conditioner. These items are NOT SUBJECT TO TURN-IN with the air conditioner when evacuated.

1-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List, Section I, and Items Troop Installed or Authorized, Section II.

a. *Source, Maintenance, and Recoverability Code (SMR).* Not applicable.

b. *Federal Stock Number.* This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. *Description.* This column indicates the Federal item name and any additional description of the item required.

d. *Unit of Measure (U/M).* A two-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e g., ft, ea, pr, etc.

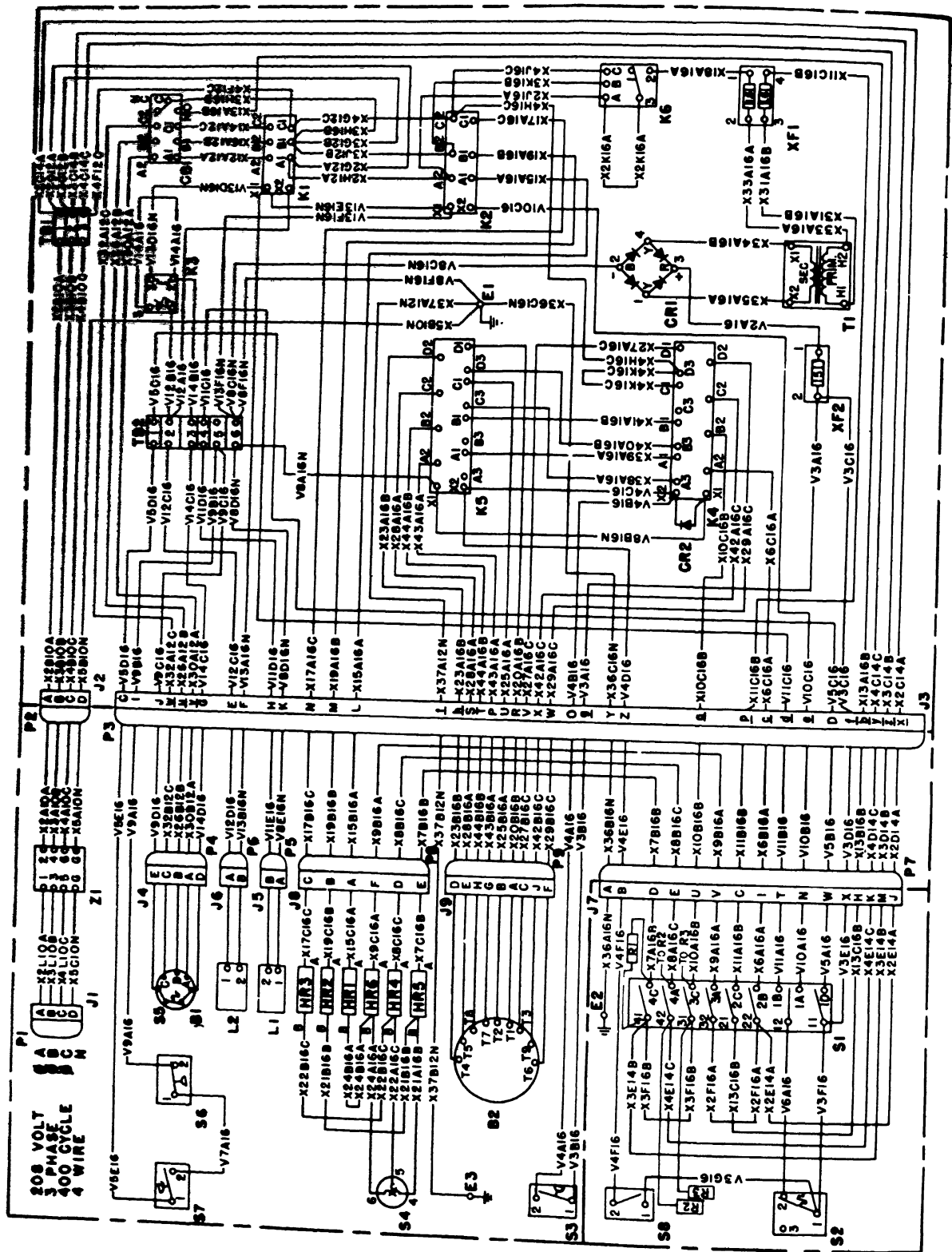
e. *Quantity Furnished with Equipment (BIIL).* Not applicable.

f. *Quantity Authorized (Items Troop Installed or Authorized).* This column indicates the quantity of the item authorized to be used with the equipment

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

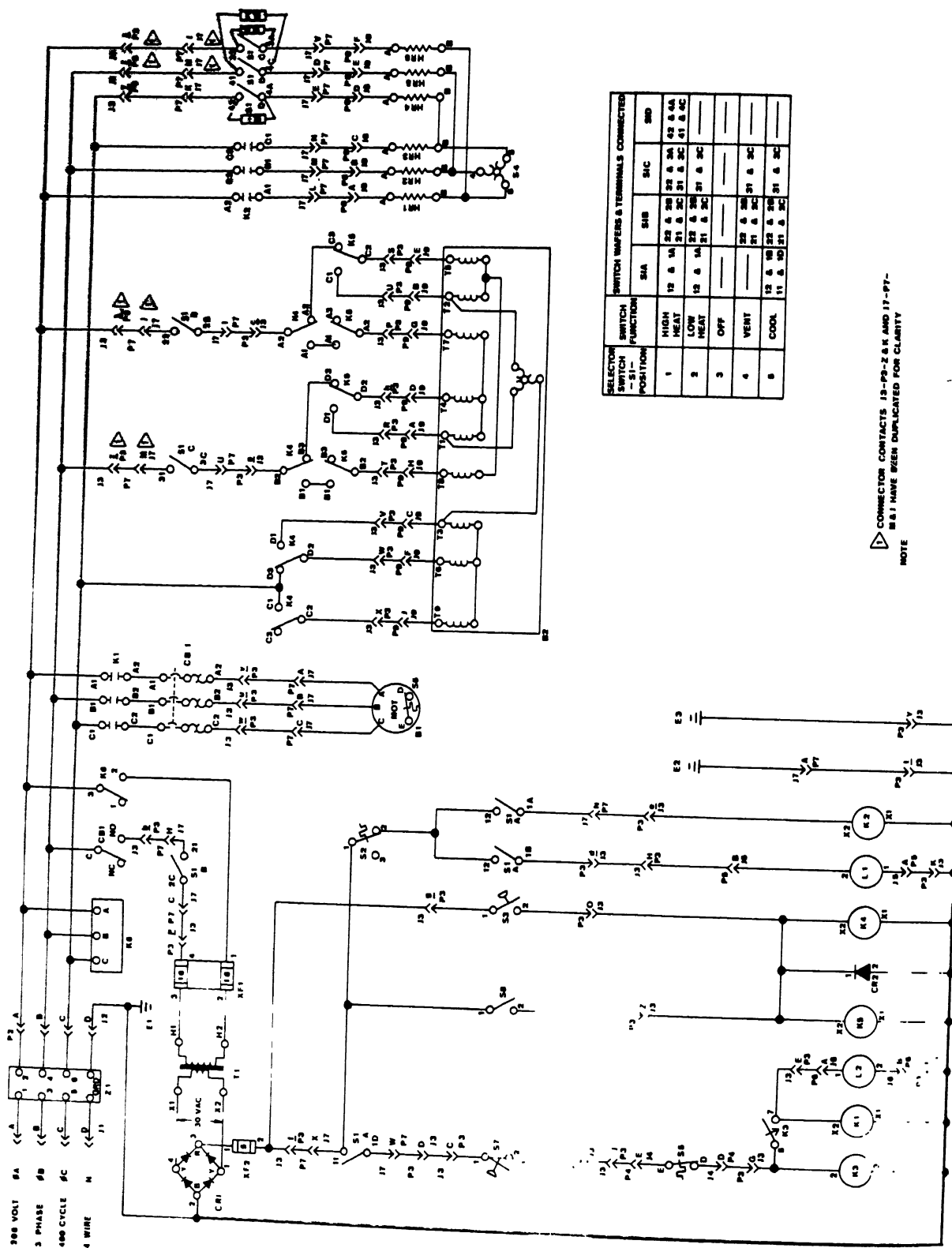
(1) SMR code	(2) Federal stock number	(3) Description Ref No & Mfr code Usable on code	(4) Unit of meas	(5) Qty auth
	7520-559-9618	CASE Maintenance and Operation Manuals	EA	1

Figure 1-4 (foldout) (rear of manual) is superseded as follows:



1	Compressor, rotary	P1	Connector, plug, power input
2	Motor, fan	P2	Connector, plug, JB
B1	Circuit breaker, B1	P3	Connector, plug, JB
R1	Rectifier	P4	Connector, plug, B1
R2	Diode	P5	Connector, plug, L1
1	Terminal stud, JB GRD	P6	Connector, plug, L2
2	Terminal stud, control panel GRD	P7	Connector, plug, control panel
3	Terminal stud, system GRD	P8	Connector, plug, heater
IR1-6	Heater element	P9	Connector, plug, B2
1	Connector, receptacle, power in	R1	Resistor, fixed
2	Connector, receptacle, JB	R2	Resistor, fixed
3	Connector, receptacle, JB	R3	Resistor, fixed
4	Connector, receptacle, B1	S1	Switch, rotary, selector
5	Connector, receptacle, L1	S2	Thermostat
5	Connector, receptacle, L2	S3	Switch, pressure, B2
7	Connector, receptacle, control panel	S4	Switch, heater cutout
3	Connector, receptacle, heater	S5	Switch, thermal B1
9	Connector, receptacle, B2	S6	Switch, high pressure cutout
1	Relay, compressor start	S7	Switch, low pressure cutout
2	Relay, heater	S8	Switch, toggle, B2
3	Relay, time delay	T1	Transformer
4-K5	Relay control B2	TB1	Terminal board, JB
6	Relay, phase sequence	TB2	Terminal board, JB
1	Valve, solenoid, B1 bypass	XF1	Fuseholder
2	Valve, solenoid, pressure equalizer	XF2	Fuseholder
		Z1	RF1 filter

Figure 1-6 (fold out) (rear of manual) is superseded as follows:



SELECTOR SWITCH POSITION	SELECTOR SWITCH FUNCTION	BRITISH WAFERS & TERMINALS CONNECTED				
		S1A	S1B	S1C	S1D	S1E
1	HIGH MEAT	12 & 1A	22 & 2B	32 & 3A	42 & 4A	52 & 5A
2	LOW MEAT	12 & 1A	21 & 2B	31 & 3C	41 & 4C	51 & 5C
3	OFF	—	—	—	—	—
4	VENT	—	—	—	—	—
5	COOL	12 & 1A	22 & 2B	32 & 3A	42 & 4A	52 & 5A

NOTE
 1. CONNECTOR CONTACTS 13-P3-Z & K AND 17-P7-M & I HAVE BEEN DUPLICATED FOR CLARITY

by order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-25C, (qty rqr block No. 541) Operator maintenance requirements for Air Conditioners, 18,000 BTU, Compact.

Change

No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C. 13 September 1972

**Operator, Organizational, Direct Support,
General Support, and Depot Maintenance Manual**

**AIR CONDITIONER, VERTICAL: COMPACT; 208 VOLT AC, 400 HERTZ,
THREE PHASE; 18,000 BTU/HR COOLING, 12,000
BTU/HR HEATING (KECO MODEL F18T4-2)**

FSN 4120-168-1775

(HARVEY W. HOTTEL MODEL CV-20-4-08)

FSN 4120-152-1150

TM 5-4120-307-15, 19 February 1970 is changed as follows:

Change cover and title page as shown above.

Page 1-1. Paragraph 1-1. *a.* The first sentence is superseded as follows: This manual is published for use of personnel to whom the Keco Model F18T42 and Harvey W. Hottel Model CV-20-4-08 air conditioners are issued.

Page 1-5, paragraph 1-4.b(1), change title to read as follows:

*(1) Air Conditioner identification plate
(Keco Model F18-T4-2 only).*

Page 1-5, paragraph 1-4.b (1.1) is added after paragraph 1-4.b (1).

*(1-1) Air Conditioner identification plate
(Model CV-20-4-08 only)*

Air Conditioner .. Vertical, compact, Military Model
CE20VAL 4-208, Harvey W. Hottel
Model CV-20-4-08, Specification
MIL-A52344B (ME), Class 3.208
Volts A.C., 400 Hertz, 3 phase.

Capacity18,000 BTU/HR
Stock NumberFSN 4120-152-1150
Part NumberR-638-70
ManufacturerHarvey W. Hottel, Inc.

Page 1-5, paragraph 1-4.b (5), change title to read as follows:

*(5) Evaporator and condenser fans
(Keco Model F18T4-2 only)*

Page 1-5, paragraph 1-4.b (5.1) is added after paragraph 1-4.b (5)

*(5.1) Evaporator and condenser fan
(Model CV-20-4-08 only).*

ManufacturerThe Trane Compan
TypeCondenser—Axial Flo
Evaporator—Centrifuga

Number per Unit1 Eac
RotationClockwise (facing condense
air discharge grille)

Page 1-6, paragraph 1-4.b (11), change title to read as follows:

*(11) Electric heaters (Keco Model F18-
T4-2 only)*

Page 1-6, paragraph 1-4.b (11.1) is added after paragraph 1-4.b. (11)

*(11.1) Electric heaters (Model CV-20-
4-08 only).*

ManufacturerElectro-Therm., Inc.
TypeStainless steel sheath
Part Number13211E8353-1
Voltage120 v
Watts600
Number Per Unit6

Page 1-6, paragraph 1-4.b (13), change title to read as follows:

*(13) Transformer, control voltage (Keco
Model F18T4-2 only).*

Page 1-6, paragraph 1-4.b (13.1) is added after paragraph 1-4.b (13).

*(18.1) Transformer, control voltage
(Model CV-20-4-08 only).*

Manufacturer ... Milwaukee Transformer Company
Primary Volts 208
Frequency 400 Hertz
Secondary Volts 30
Ampere Output 2.2
Primary Connections H-1 and H-2
Secondary Connections X-1 and X-2

Page 1-6, paragraph 1-4.b (15), change title to read as follows:

(15) Diode, semi-conductor (Keco Model F18T4-2 only).

Page 1-6, paragraph 1-4.b (15.1) is added after paragraph 1-4.b (15).

(15.1) Diode, semi-conductor (Model CV-20-4-08 only).

Manufacturer Sarkes Tarzian
Type Silicon-hermetically sealed
Peak Reverse Voltage (Minimum) 375 Volts
Maximum Voltage Drop (full load) 0.5 Volts
Maximum forward current 2.0 Amp
Part Number IN1695

Page 1-6, paragraph 1-4.b (21), change title to read as follows:

(21) Heaters, electrical (Keco Model F18T4-2 only).

Page 1-6, paragraph 1-4.b (21.1) is added after paragraph 1-4.b (21).

(21.1) Heaters, electrical (Model CV-20-4-08 only)

Manufacturer Electro-Therm, Inc.
Type Tubular
Volts 120
Wattage 600

Page 1-7, paragraph 1-4.b (30), change title to read as follows:

(30) Filter, radio frequency interference (Keco Model F18T4-2 only).

Page 1-7, paragraph 1-4.b (30.1) is added after paragraph 1-4.b (30).

(30.1) Capacitors, radio frequency interference. (Model CV-20-4-08 only).

Manufacturer Aerovox
Type Metallized Mylar Film
Part Number V146ZE-10
Rating 2 Micro Farad, 400 VDC
Number Per Unit 1

Page 1-7, paragraph 1-4.b (31) is added after paragraph 1-4.b (30).

(31) Capacitor, radio frequency interference (Model CV-20-4-08 only).

Manufacturer Aerovox
Type Metallized Mylar Film
Part Number V146ZE-10
Rating 1 Micro Farad, 200 VDC
Number Per Unit 1

Page 1-7, paragraph 1-5 is superseded as follows:

1-5. Difference in Models.

This manual covers the Keco Model F18T4-2 air conditioner, Serial Nos. 68492 through 68757 and the Harvey W. Hottel Model CV-20-4-08 air conditioner, Serial Nos. 101 through 459. This manual covers the above models and serial number ranges only. Differences exist between the two models in the type of radio frequency interference suppression system and deletion of the head pressure control tank/check valve system in the Model CV-20-4-08 air conditioner. The deletion of the head pressure control tank/check valve system is the result of the elimination of the zero degree outside air temperature starting requirement for the air conditioner. Some of the components are of different manufacture in the two models.

Page 1-7, Figure 1-4: Change caption to read as follows:

Figure 1-4. Wiring diagram (Keco Model F18T4-2 only).

Page 1-7, Add figure 1-4.1.

Figure 1-4-1. Wiring diagram, ME 4120-307-15/1-4.1 C3 (Model CV-20-4-08 only).

(Located in back of manual)

Page 1-8, Figure 1-5: Change caption to read as follows:

Figure 1-5. Refrigerant fluid diagram, (Keco Model F18T4-2 only) (sheet 1 of 2).

Page 1-8, add figure 1-5.1:

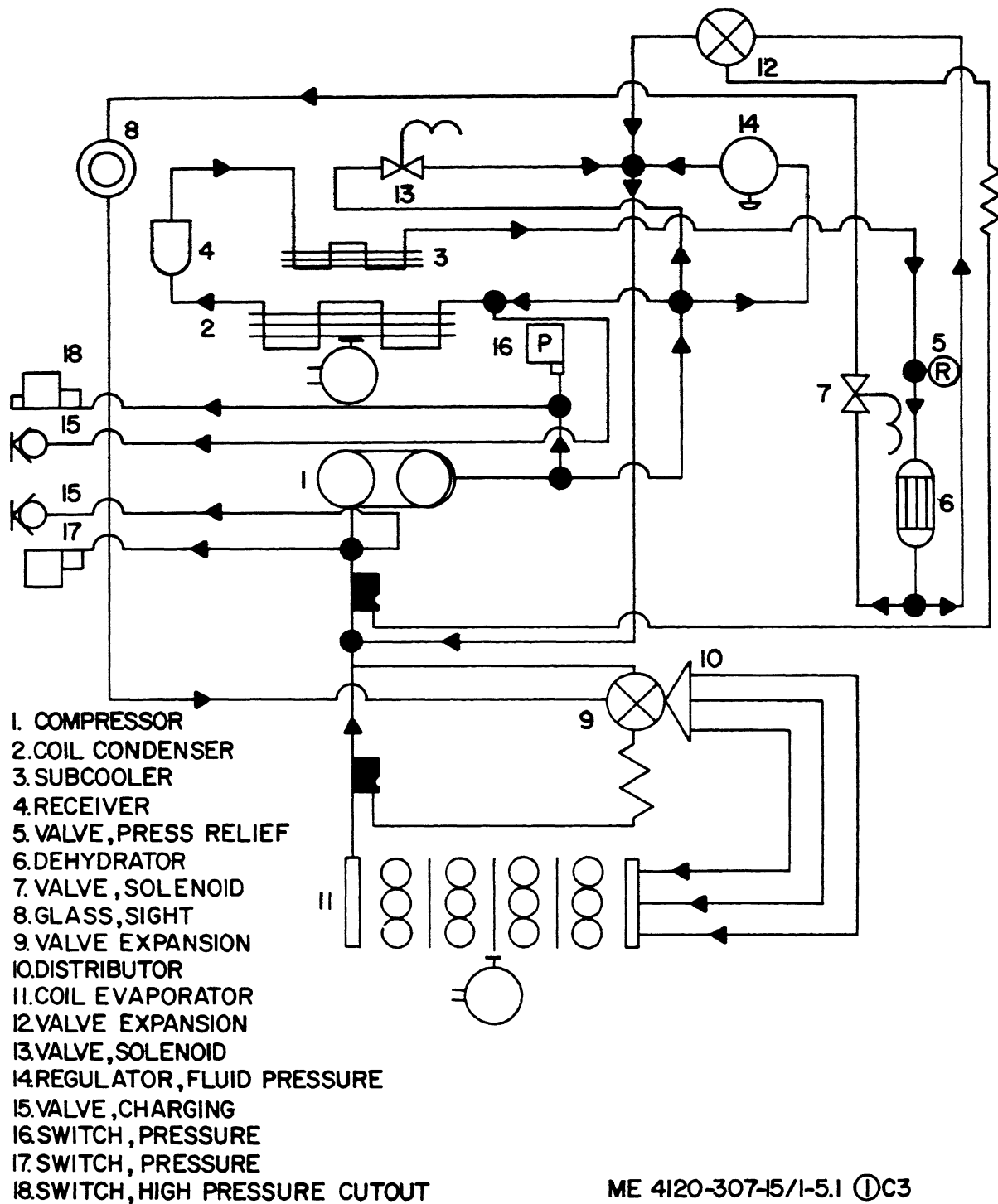
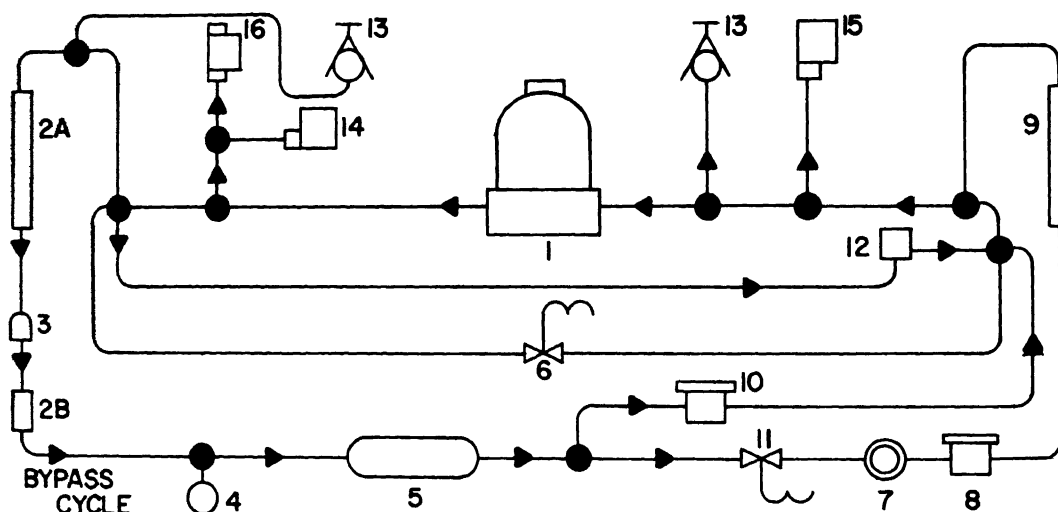
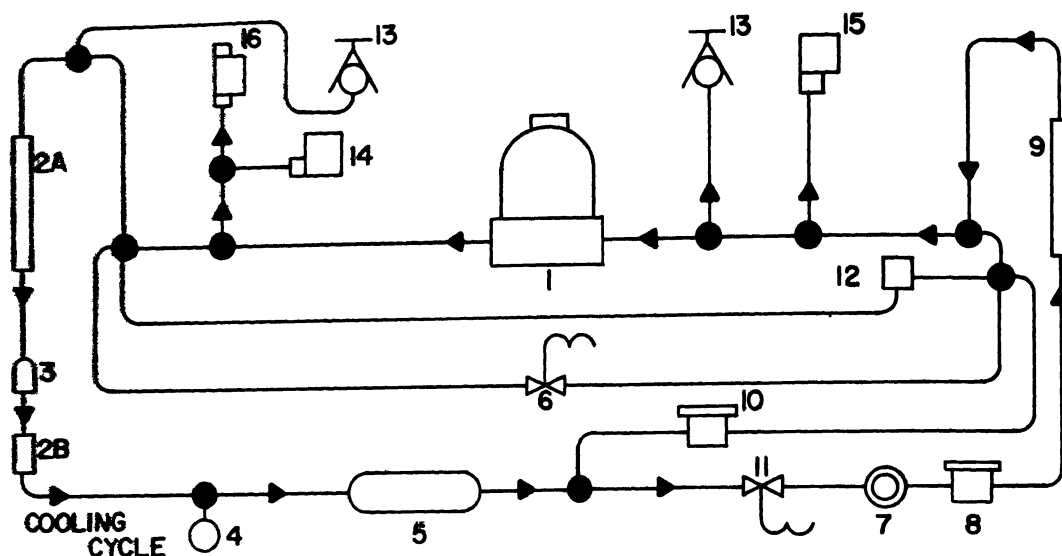


Figure 1-5.1 Refrigerant fluid diagram. ME 4120-307-15/1-5.1 1 C3
 (Model CV-20-4-08 only)(sheet 1 of 2)

Page 1-9, Figure 1-5: Change caption to read
as follows:
Figure 1-5. Refrigerant fluid diagram, (Keco.

Model F18T4-2 only) (sheet 2 of 2).
Page 1-9, Add figure 1-5.1:



- | | |
|------------------------------|----------------------------------|
| 1. COMPRESSOR | 8. VALVE, EXPANSION EVAPORATOR |
| 2A. COIL CONDENSER | 9. COIL, EVAPORATOR |
| 2B. SUBCOOLER | 10. VALVE, EXPANSION QUENCH |
| 3. RECIEVER | 11. VALVE, SOLENOID, LIQUID LINE |
| 4. VALVE, PRESSURE RELIEF | 12. REGULATOR, FLUID PRESSURE |
| 5. DEHYDRATOR DESICCANT | 13. VALVE, SERVICE WITH CAP |
| 6. VALVE, SOLENOID EQUALIZER | 14. SWITCH, PRESSURE, FAN SPEED |
| 7. GLASS, SIGHT | 15. SWITCH, LOW PRESSURE CUTOUT |
| | 16. SWITCH, HIGH PRESSURE CUTOUT |

Figure 1-5.1. Refrigerant fluid diagram. ME 4120-307-15/1-5.1 2 C3
(Model CV-20-4-08 only) (sheet 2 of 2)

Page 1-9, Figure 1-6: Change caption to read as follows:
Figure 1-6. Wiring schematic diagram, (Keco

Model F18T4-2 only).

Page 1-9. Add figure 1-6.1.

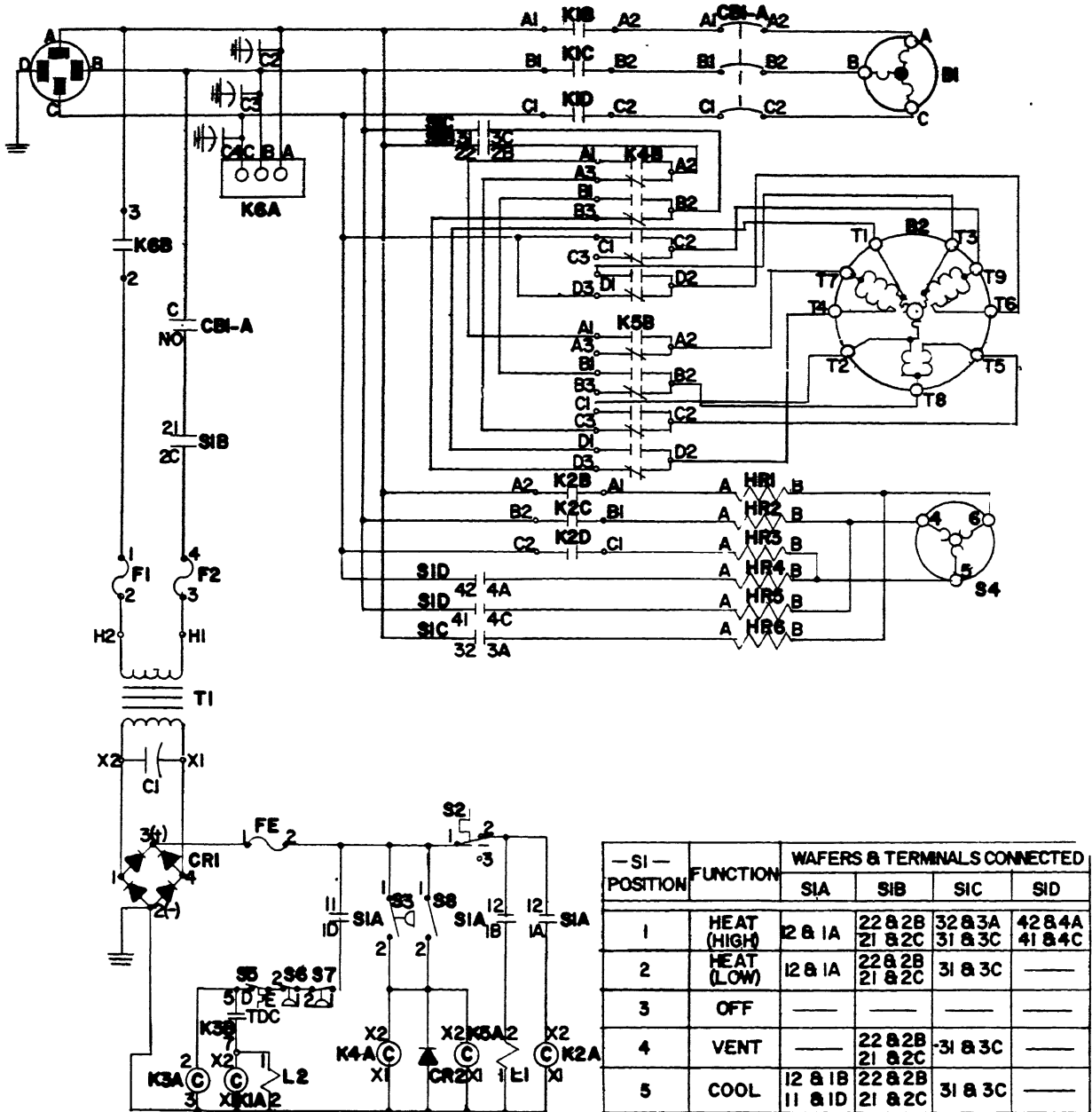
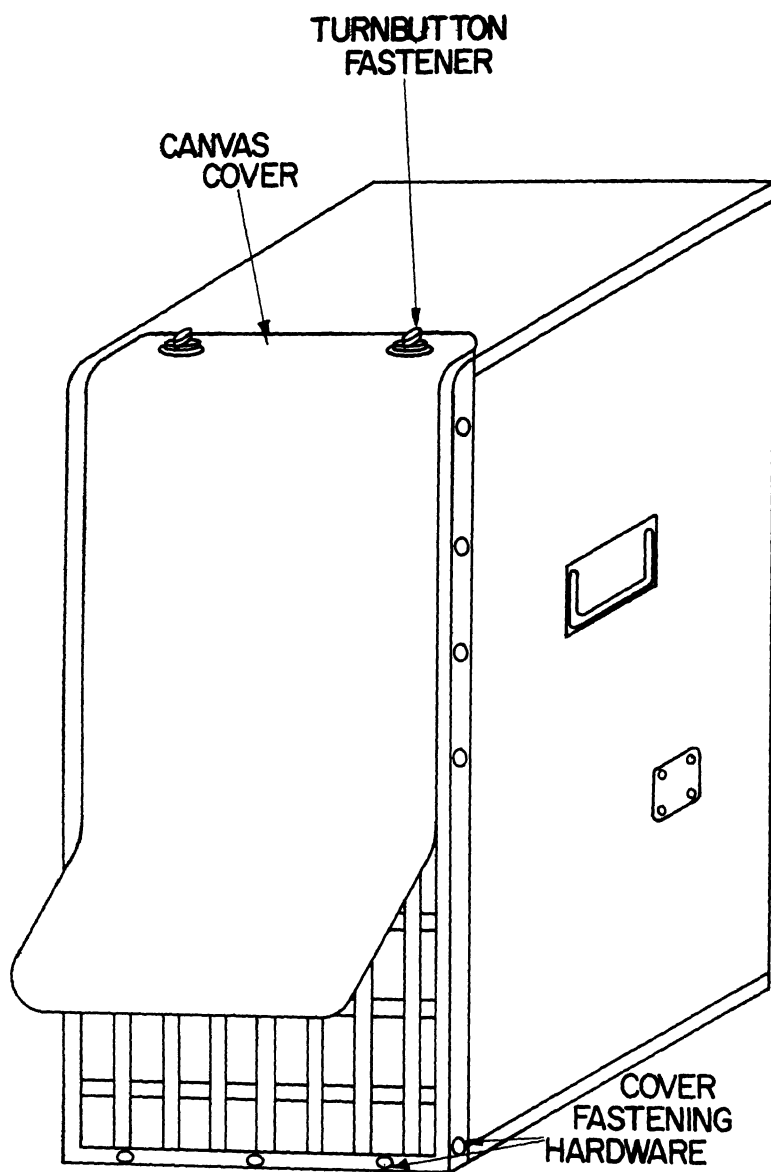


Figure 1-6.1. Wiring schematic diagram, ME 4120-307-15/1-6.1 C3
(Model CV-20-4-08 only)



*Figure 1-7. Air Conditioner, cover installation, ME 4120-307-15/1-7 CS
(Model CV-20-4-08 only)*

c. *Installing unit.* Bolt unit to the floor or other flat surface. Refer to base plan (fig. 1-3) for dimensions. Connect drain base (not less than two feet long and not greater than 5/16 inch ID) to the 1/2 npt condensate drain connections located around the base of the unit to lead condensate away. Utilize as many of the four drain connections as possible to obtain optimum drainage. The two side connections provide superior draining to the front and rear outlets. The rear drain provides the poorest service and should be used as a single drain only if none of the remaining connections are accessible in the mounting location utilized. Support the unit at the top using a mounting bolt (fig. 1-2).

Page 2-5, Figure 2-3A: The head pressure control tanks shown below the evaporator expansion valve are incorporated in the Keco Model F18T4-2 only.

Page 3-2, Figure 3-1: The head pressure control tanks are incorporated in the Keco Model F18T4-2 only.

Page 3-4, Figure 3-4: The check valve is incorporated in the Keco Model F18T4-2 only.

Page 3-12, paragraph 3-23.b (1.1) is added after paragraph 3-23.b (1).

(1.1) (Model CV-20-4-08 only) Remove spring from chain and mounting hole in damper door assembly.

Page 3-17. Paragraph 3-40: Change title to read as follows:

3-40. RFI Filter (fig. 1-4) (Keco Model F18T4-2 only).

Page 3-17, paragraph 3-40.1 is added after paragraph 3-40.

3-40.1. RFI Suppression Capacitors. (Model CV-20-4-08 only).

The RFI suppression equipment supplied in the Model CV-20-4-08 air conditioner consists of three 2 micro-farad capacitors wired across each of the three phase leg inputs to the phase sequence relay and the unit ground and one 1 micro-farad capacitor wired across the secondary terminals X1 and X2 of transformer (T1). Figures 1-4.1 and 1-6.1 show the wiring of the four capacitors. Figure 7-6.1 shows the location of the four capacitors in the junction box.

Page 6-1, paragraph 6-4.g, change title to read as follows:

g. *Thermostatic Expansion Valve (evaporator)* (Keco Model F18T4-2 only).

g.1. *Thermostatic Expansion Valve (evaporator)* (Model CV-20-4-08 only).

Manufacturer	Alco Valve Company
Model	TCLE100HW100-6A
Type	Angle
Inlet	3/8 in. nominal
Outlet	3/8 in. nominal
Setting	6°F ± 1.5°F (- 14.4°C ± 0.84°C).

Page 6-2, paragraph 6-4.h, change title to read as follows:

h. *High pressure Cutout control* (Keco Model F18T4-2 only).

Page 6-2, paragraph 6-4.h.1. is added after paragraph 6-4.h.

h.1. *High Pressure Cut-out Control*. (Model CV-20-4-08 only).

Manufacturer	Penn Controls, Inc.
Model	210-AP-40-AN
Connection	1/4 in. SAE Flare
Cut-out Point	460 ± 10 psig
Manual Reset	Below 415 psig

Page 6-2, paragraph 6-4.k., change title to read as follows:

k. *Capacities* (Keco Model F18T4-2 only).

Page 6-2, paragraph 6-4.k.1 is added after paragraph 6-4.k.

k.1. *Capacities* (Model CV-20-4-08 only).

Compressor crankcase	20.5 oz.
Refrigerant charge	4 lbs.

Page 6-2, paragraph 6-4.m. change title to read as follows:

m. *High Pressure Cutout Switch S6* (Keco Model F18T4-2 only).

Page 6-2, paragraph 6-4.m.1 is added after paragraph 6-4.m.

m.1. *High Pressure Cut-out Switch S6* (Model CV-20-4-08 only).

Manufacturer	Penn Controls, Inc.
Model	210-AP-40-AN
Cut-out Point	460 ± 10 psig
Manual reset	Below 415 psig
Contact type	Single pole, Single throw

Page 6-2, paragraph 6-4.p. change title to read as follows:

p. *Expansion Valve, Evaporator, 1 ton* (Keco Model F18T4-2 only).

Page 6-2, paragraph 6-4.p.1 is added after paragraph 6-4.p.

p.1. *Expansion Valve, Evaporator, 1 Ton* (Model CV-20-4-08 only).

Super heat $6 \pm 1.5^{\circ}\text{F}$
($- 14.4^{\circ}\text{C} \pm 0.84^{\circ}\text{C}$) for R22

Valve Body Brass
Type Angle
Inlet $\frac{1}{2}$ in. nominal
Outlet $\frac{1}{2}$ in. nominal

Page 6-2, paragraph 6-4.q. Change title to read as follows:

q. *Expansion valve, bypass, $\frac{1}{4}$ ton (Keco Model F18T4-2 only).*

Page 6-2, paragraph 6-4.q.1 is added after paragraph 6-4.q.

q.1. *Expansion valve Bypass, $\frac{3}{4}$ ton (Model CV-20-4-08 only).*

Manufacturer Alco Valve Co.
Part No. TCL-75C-15B
Capacity $\frac{3}{4}$ ton
Superheat $25 \pm 1.5^{\circ}\text{F}$
($- 3.9^{\circ}\text{C} \pm 0.84^{\circ}\text{C}$) for R22

Valve Body Brass

Page 6-2, paragraph 6-4.u. Change title to read as follows:

u. *Diagrams (Keco Model F18T4-2 only).*

Page 6-2, paragraph 6-4.u.1 is added after paragraph 6-4.u.

u.1. *Diagrams (Model CV-20-4-08 only).*

Figure 1-4.1 shows a wiring diagram of the air conditioner while figure 1-5.1 illustrates a refrigeration flow diagram.

Page 6-2, paragraph 6-4.v. Change title to read as follows:

v. *Refrigerant Check Valve (Keco Model F18T4-2 only).*

Page 6-2, paragraph 6-4.x. Change title to read as follows:

x. *Receiver (Keco Model F18T4-2 only).*

Page 6-2. Paragraph 6-4.x.1 is added after paragraph 6-4.x.

x.1. *Receiver (Model CV-20-4-08) only).*

Manufacturer Harvey W. Hottel, Inc.
Part Number 13215E9833

Page 6-7, paragraph 6-14 is added after paragraph 6-13.

-14. Air Conditioner cover Model CV-20-4-08 only).

a. *Opening for cooling operation (fig. 1-7).* The cover is fastened to the sides, bottom and top of the air conditioner with screws and washers. It may be left secured to the casing and opened for cooling operation by opening the zippered center lap and rolling the flap up to uncover the condenser air intake and discharge openings. The

CAUTION

Never operate the air conditioner on the cooling cycle unless the canvas cover is rolled up or removed completely.

b. *Removal (fig. 1-7).* The cover is removed from the air conditioner by removal of the screws and washers securing it to the top, bottom and sides of the air conditioner. After removing the cover and the four screws and washers at the base of the air conditioner, replace the four screws and washers to secure the lower portion of the condenser coil guard to the casing.

c. *Installation (fig. 1-7).* Installation of the canvas cover shall be in the reverse order of removal.

Page 7-4, paragraph 7-4.e (4): (Keco Model F18T4-2 only).

Page 7-4, paragraph 7-4.e. (4.1) is added after paragraph 7-4.e (4).

(4.1) (Model CV-20-4-08 only) Set temperature control switch above ambient or room temperature. Open refrigerant drum shut-off valve. Operate unit in the cool position and weigh in 4 lbs charge of refrigerant 22. The sight glass should indicate full when the full four pounds charge is added.

CAUTION

Do not charge the Model CV-20-4-08 air conditioner with more than four pounds of refrigerant. A charge of greater than this amount will create excessive head pressures and will cause discharge of the excess charge through the safety relief valve.

Page 7-9, paragraph 7-12.b., change title to read as follows:

b. *Disassembly (fig. 7-6) (Keco Model F18T4-2 only).*

Page 7-9, paragraph 7-12.b.1 is added after paragraph 7-12.b.

b.1. *Disassembly (fig. 7-6.1) (Model CV-20-4-08 only).*

(1) Refer to paragraph 7-11 to gain access to the junction box.

(2) Remove the control panel from the junction box top as described in paragraph 7-11.

(3) Disconnect and tag the two electrical connectors from the rear of the junction box.

(4) Unscrew the white knob from the

bottom of the image and remove image.

(5) Loosen two screws (1) on each side of box and remove junction box assembly.

(6) Remove the front cover (8) of the junction box by loosening the four screws (6).

(7) Disconnect and tag leads to circuit breaker (13). Remove the six screws (11) holding the circuit breaker and remove the circuit breaker (13) from the junction box.

(8) Remove the three fuses (48 and 49) from the fuse holders.

(9) Disconnect and tag the leads from the transformer (16). Remove and tag the 1 micro-farad capacitor (66) from the secondary terminals of the transformer (16). Remove the transformer by removing the four nuts securing it to the junction box top panel.

(10) Remove the eight screws (43) from the rear of the junction box and pull forward the components panel (44) that they secure.

(12) Remove relays (32, 36, 47, and 55) and fuse holders (52 and 53), and terminal boards (39 and 42) by removing screws (38 and 40). Remove and tag 3 two micro-farad capacitors (64) and grounding lead (65) from the ground lugs (29 and 62) and terminal board (42). Remove wiring harnesses (21 and 26) by removing screws (20 and 25). Remove rectifier (56).

Page 7-10, Figure 7-6: Change caption to read as follows: Figure 7-6. Junction box assembly, exploded view (Keco Model F18T4-2 only) (sheet 1 of 2)

Page 7-10, Add Figure 7-6.1.

Page 7-11, Figure 7-6: Change caption to read as follows: Figure 7-6. Junction box assembly, exploded view — continued (Keco Model F18T4-2 only).

Page 7-11. Add key to figure 7-6.1.

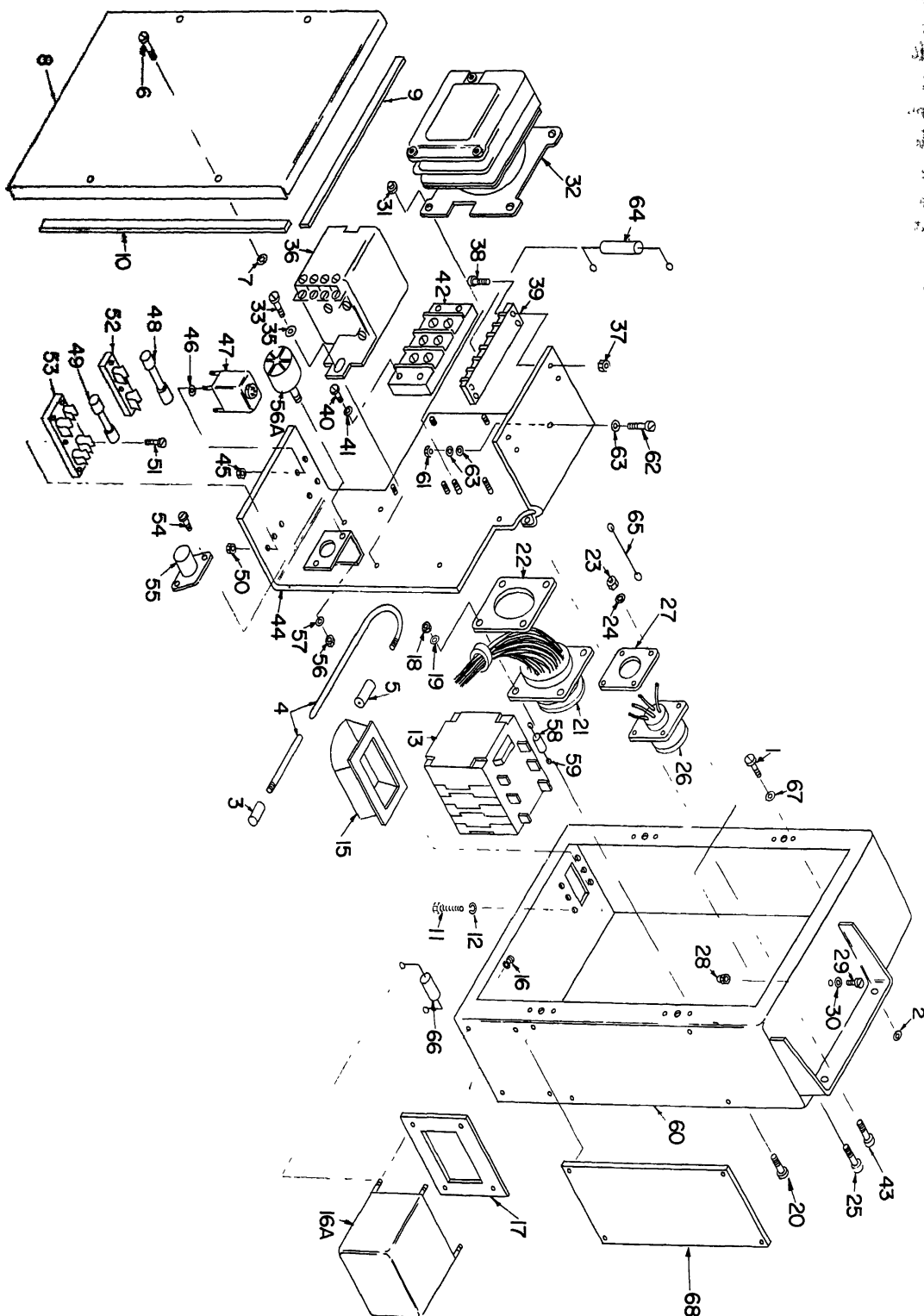


Figure 7-4-1. Junction box assembly, exploded view—(Model CV-20-4-08 only)

- | | |
|---------------------------|----------------------------------|
| 1. Screw | 35. Washer (6) |
| 2. Washer, retainer (2) | 36. Relay (2) |
| 3. Knob | 37. Nut (4) |
| 4. Rod, linkage | 38. Screw (4) |
| 5. Connector, linkage | 39. Terminal board |
| 6. Screw (4) | 40. Screw (4) |
| 7. Washer, retainer (4) | 41. Washer (4) |
| 8. Cover, junction box | 42. Terminal board |
| 9. Gasket (2) | 43. Screw (8) |
| 0. Gasket (2) | 44. Panel, junction box |
| 1. Screw (6) | 45. Nut (4) |
| 2. Washer (6) | 46. Washer (4) |
| 3. Circuit breaker | 47. Relay, phase sequence |
| 4. (Deleted) | 48. Fuse |
| 5. Cover, circuit breaker | 49. Fuse (2) |
| 6. Nut (4) | 50. Nut (2) |
| 6a. Transformer | 51. Screw (2) |
| 7. Gasket | 52. Fuseholder |
| 8. Nut (4) | 53. Fuseholder |
| 9. Washer (4) | 54. Screw (2) |
| 0. Screw (4) | 55. Relay, time delay |
| 1. Wiring harness (J3) | 56. Nut |
| 2. Gasket | 56a. Rectifier |
| 3. Nut (4) | 57. Washer (2) |
| 4. Washer (4) | 58. Diode, semi-conductor |
| 5. Screw (4) | 59. Terminal, lug (2) |
| 6. Wiring harness (J2) | 60. Junction box |
| 7. Gasket | 61. Nut |
| 8. Nut | 62. Screw |
| 9. Screw | 63. Washer (3) |
| 0. Washer (3) | 64. Capacitor assembly, 2 MF (3) |
| 1. Nut (8) | 65. Ground strap |
| 2. Relay (2) | 66. Capacitor assembly, 1 MF |
| 3. Screw (6) | 67. Washer (2) |
| 4. Deleted | 68. Gasket |

*Figure 7-6.1. Junction box assembly, exploded view—
(Model CV-20-4-08 only)*

Page 7-11. Figure 7-6. Change caption to read as follows: Figure 7-6. Junction box assembly, exploded view, (Keco Model F18T4-2 only). (sheet 2 of 2) see chart 1 for key.

Page 7-16, paragraph 7-16.a: Change title to read as follows:

a. General (Keco Model F18T4-2 only).

Page 7-16, paragraph 7-16.a.1 is added after paragraph 7-16.a.

a.1. General. (Model CV-20-4-08 only). The condenser coil and subcooler is an integral unit, non-repairable except as described under repairs below, and cannot be disassembled. The receiver is a non-repairable item itself, but may be removed from its mounting and a new one installed when required.

Page 7-24. Paragraph 7-23. Change title to

read as follows: 7-23. Tank (Keco Model F18T4-2 only).

Page 7-25. Figure 7-17. Change caption to read as follows: Figure 7-17, tank, removal and installation (Keco Model F18T4-2 only).

Page 7-26. Paragraph 7-26. Change title to read as follows: 7-26. Check Valve (Keco Model F18T4-2 only).

Page 7-27. Figure 7-20. Change caption to read as follows: Figure 7-20. Check valve, removal and installation (Keco Model F18T4-2 only).

Page 7-29. Paragraph 7-28. The fourth sentence is superseded and the following sentence is substituted.

To check the S6, high pressure switch, block the condenser coil, use a gage in the discharge charging valve and when the pressure

reads 445 ± 5 psig for Model F18T4-2 or 460 ± 10 psig for Model CV-20-08 air conditioner, the switch should actuate and stop the compressor.

Page 7-30, paragraph 7-32.b. (3) (Keco Model F18T4-2 only).

Page 7-30, Paragraph 7-32.b. (3.1) is added after paragraph 7-32.b (3).

(3.1) (Model CV-20-4-08 only). High pressure cut-out switch (S6) should be set for 460 ± 10 psig.

By Order of the Secretary of the Army:

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

BRUCE PALMER, JR.
General, U. S. Army
Acting Chief of Staff

Distribution:

To be distributed in accordance with DA Form 12-25C, Operator's Maintenance requirements for Air Conditioners, 12,000 and 18,000 BTU, Compact.

CHANGE

o. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 18 November 1971

**Operator, Organizational, Direct Support, General Support,
and Depot Maintenance Manual**

**AIR CONDITIONER, VERTICAL: COMPACT; 208 VOLT AC, 400 HERTZ,
THREE PHASE; 18,000 BTU/HR COOLING, 12,000 BTU/HR
HEATING (KECO MODEL) F18T4-2
FSN 4120-168-1775**

TM 5-4210-307-15, 19 February 1970, is changed as follows:

back of Cover Page, Safety Precautions. Add the following:

BEFORE OPERATION, line 8. Do not touch pins in power receptacle.

AFTER OPERATION, line 9. Do not touch pins in power receptacle.

Page 1-5. Paragraph 1-4b (2); line 3 is changed to read as follows:

P (horsepower) 1.6/ .19

Page 2-1, paragraph 2-3c. Third sentence is superseded as follows:

Remove the drain plugs from the two sides and rear of the unit (fig. 1-1). The drain plug on the control, panel side remains in place. Install drain hose assembly kit by installing drain elbows in each drain connection and attach 5/16 inch I.D. drain hoses to each elbow. Tilt air conditioner 5 degrees toward rear. Manifold the drain lines to a single four foot long drain hose. Periodic cleaning of these drain hoses and drain traps inside unit may be required.

Page 2-8, paragraph 2-21 is added:

**21. Operation With a Chemical and
Biological Filter**

When conditions require operating the air conditioner using a chemical and biological filter, the

unit should be prepared for operation by removing CBR cover (fig. 1-2). Attach duct from a suitable CBR filter to CBR duct. Close fresh air damper door by pulling damper door chain. The unit is now ready for CBR mode operation.

Page 3-7, paragraph 3-8b. First sentence is superseded as follows:

Wash the filter and mist eliminator with dry cleaning solvent, Federal Specification P-D-680, and air dry or use low pressure compressed air.

Paragraph 3-11b First sentence is superseded as follows:

Wash the screen with dry cleaning solvent, Federal Specification P-D-680, and air dry or use low pressure compressed air.

Page 3-11, paragraph 3-15. Delete the note in its entirety.

Paragraph 3-15. Add the following:

Trouble	Expedient remedy
Time delay relay defective	Bypass relay by installing a jumper wire across terminals 5 and 7 of K3.

Page 3-11, paragraph 3-16. Delete the note in its entirety.

Paragraph 3-16, line 14. Under "Trouble" first sentence is changed to read as follows: Phase sequence relay defective.

Page 3-12. Paragraph 3-23.1 is added:

3-23.1. Baffle and Fan

a. Removal.

(1) Remove condenser fan guard and fan. (See fig. 3-3).

(2) Remove baffle (see fig. 3-8) and remove screw (6), washers (7), (9), and spacer (10).

b. Inspection. Inspect baffle for damage.

c. Installation. Installation is in reverse order of removal.

Page 3-15, paragraph 3-29. First sentence is superseded:

A normally open relay that is closed when the rotary selector switch is moved to the COOL position (COOL mode).

Page 3-16, paragraph 3-36b, line 4. The word "Remove" is changed to read "Reverse".

Page 3-17, paragraph 3-38b, line 5. The word "rater" is changed to read "rated".

Paragraph 3-41a, line 8. The word "can" is changed to read "will".

Paragraph 3-42a, Sentence two (2) is superseded.

The switch will operate the motor on low speed only when system discharge pressure is below 350 psig.

Page 3-27, paragraph 3-54c. Step c is superseded.

c. Installation and Test.

(1) Install the condensate drain tube with ball check assembly in reverse order of removal.

(2) Pour water in drain pan and test valve for proper draining.

(3) Install the front panel on the front of the unit with two screws.

Page 4-1. Add the following:

A paulin cover may be used with this unit. It is used to prevent dust, dirt, and sand from entering the condenser and blower motor section of the unit when in transit or during extended periods of non-use. It is to be removed whenever the unit is operated.

Page 6-7, paragraph 6-14 is added:

6-14. Panel, Bottom, and Base

a. Removal.

(1) Remove front access panel, figure 1-1.

(2) Refer to paragraph 3-46 and remove control panel.

(3) Refer to figure 6-4 and remove compressor.

(4) Remove four bolts which attach casing assembly to panel bottom.

(5) Remove casing assembly from bottom panel.

b. Inspection. Inspect the panel for dents and cracks.

c. Installation. Installation is in reverse order of removal.

Page 7-9, paragraph 1-12b (9) is superseded.

(9) Disconnect and tag the leads from the transformer (12) at fuse holder (38) and at the rectifier (30). Remove screw (12) connecting wires to the junction box. Remove screws (2 & 7) holding wiring harness (1 & 6) to the junction box.

Paragraph 7-12b (11) is superseded.

(11) Remove the transformer by removing the four lead wires and the four nuts attaching the transformer to the junction box.

Paragraph 7-12b(12) is superseded.

(12) Disconnect and tag all electrical leads.

Paragraph 7-12b(13) is added.

(13) Remove relays (32, 35, 52, 56, 63, & 65), fuse holders (38 & 42), and terminal boards (46 & 49) by removing screws (47 & 50).

Page B-2, Section II. Delete lines 7 thru 13. "Troop Installed or Authorized and continuing thru 13211E798".

Page C-2, Section II. Maintenance Allocation Chart.

Group 1501, line 2. "Base assembly" is changed to read "Panel, bottom, base".

Line 5, line 5. Delete entire line "Screen, drain base" column A "O" and column H "O".

Group 1801, line 2. "Baffle" is changed "Baffle, fan" and column H is changed from "H" to "O".

Group 4000, line 2. "Mount Bushing" is changed to read "Mount, resilient".

Page C-3, group 4006, line 3. "Protector, overload" is changed to read "Protector, overload, thermal".

Group 4009, line 7. "Leads electrical" is changed to read "Wiring harness".

Line 8. "Receptacle" is changed to read "Power receptacle, connector".

Group 4010, line 3. "Contactor" is changed to read "Relay, electrical".

Group 4012, line 5. "Switch, thermostatic" is changed to read "Switch, heater".

After line 5, add the following:
"Switch, heater, cutout, high temperature "Test "O" and replace "O".

Line 7. "Switch, fan speed" is changed to read "Switch, fan speed, toggle".

Page C-4, Group 5241, line 3. "Tube, drain" is changed to "Tube, drain, condenser". Maintenance functions are changed as follows: Test "O", service "O", and replace "O". Adjust is deleted. Remarks column add an "F".

Section IV, Remarks. Add the following at bottom of list. Under "Reference Code" add "E-C". Under "Remarks" add: Clean condensate drain to include evaporator drain pan and upper drain line.

Page I-1, Index. After line 19, add the following:

"Connector, assembly, remote control". Under "paragraph", add: "2-3". Under "Page", add: "2-1".

Line 21. Before "Condenser coil" add: "Connector, receptacle:". Under "Paragraph" add: "3-48 and 3-49". Under "Page" add: "3-21" and "3-22".

Page I-2, line 10. Before "Fresh air inlet filter" add: "Filter radio interference suppression". Under "Paragraph" add: "3-40". Under "Page" add: "3-17".

Line 42. After "Movement to a New Worksite" add: "Mount resilient". Under "Paragraph" add: "3-44" and "6-13". Under "Page" add: "3-20" and "6-6".

Line 53. After "Organizational maintenance repair parts" add: "Panel, bottom, base". Under "Paragraph" add: "6-14". Under "Page" add: "6-9".

Line 56. After "Panels and grilles" add: "Paulin and condenser cover". Under "Page" add: "4-1".

Page I-3. After line 6, add the following: "Protector, overload, thermal". Under "Paragraph" add: "7-10". Under "Page" add: "7-7".

Line 14. After line 13, add the following: "Relay, electrical". Under "Paragraph" add: "3-28", "3-29". Under "Page" add: "3-15".

Line 35. After "Sight glass" add: "Sound attenuator". Under "Page" add: "4-1".

Line 45. After "Suction pressure inadequate" add: "Switch, fan speed, toggle". Under "Paragraph" add: "3-42". Under "Page" add: "3-17".

Line 46. After "Switch, fan speed, toggle" add: "Switch, selector, rotary". Under "Paragraph" add: "3-32". Under "Page" add: "3-16".

Line 47. After "Switch, selector, rotary", add: "Switch, thermostat: temperature control". Under "Paragraph" add: "7-11". Under "Page" add: "7-9".

Line 49. Is changed to read "Heater, cutout, high temperature".

Line 53. After line 53 add: "Transformer". Under "Paragraph" add: "3-55". Under "Page" add: "3-17".

Page I-4. After line 1 add the following: "Tube, drain, condensate". Under "Paragraph" add: "3-54". Under "Page" add: "3-27".

Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Recd:

VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

tribution:

To be distributed in accordance with DA Form 12-25C (qty rqr block No. 342) organizational maintenance requirements
Air Conditioners: 18,000 BTU, Compact.



CHANGE }
No. 1 }

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 30 January 1971

**Operator, Organizational, Direct Support, General Support
and Depot Maintenance Manual**

**AIR CONDITIONER, VERTICAL: COMPACT, 208 VOLTS, A. C.,
400 HERTZ, THREE PHASE, 18,000 BTU/HR COOLING,
12,000 BTU/HR HEATING (KECO MODEL F18T4-2)
FSN 4120-168-1775**

TM 5-4120-307-15, 19 February 1970, is changed as follows:

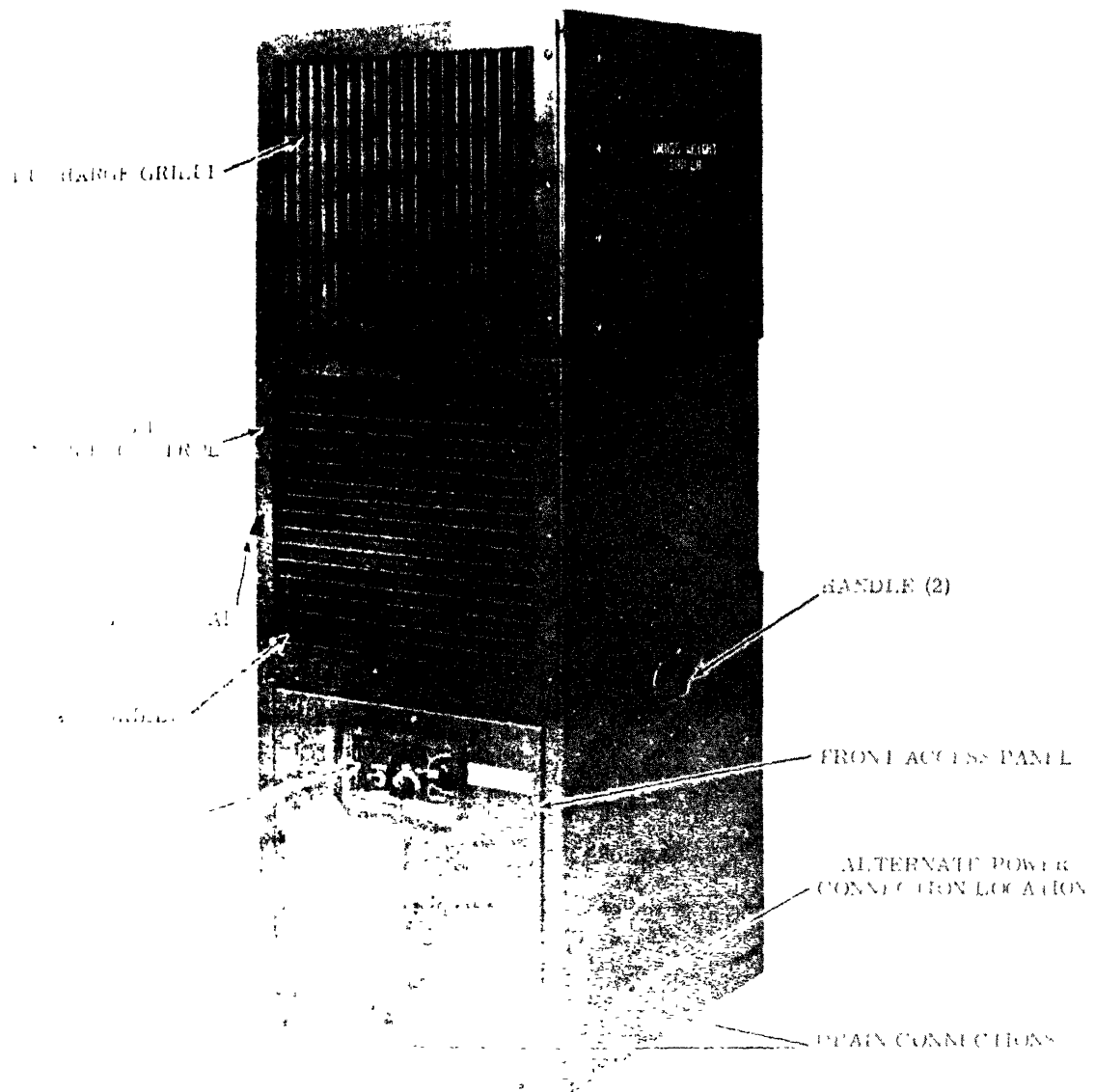
Page iii. In LIST OF ILLUSTRATIONS, delete figures 1-4 and 1-6. Add figures 3-6.1 between figures 3-6 and 3-7, and add figures FO-1 and FO-2 to bottom of list as follows:

<i>Fig. No.</i>	<i>Title</i>	<i>Page</i>
3-6.1	RPI filter, removal and installation.	3-14.1
FO-1	Wiring diagram.	Rear of Manual
FO-2	Schematic wiring diagram.	Rear of Manual

Page 1-1. Paragraphs 1-1d and 1-1e are added as follows:

d. Refer to TM 740-90-1 (Administrative Storage of Equipment) for information and instructions pertaining to organizational administrative storage.

e. Refer to TM 750-244-3 (Procedures for Destruction of Equipment to Prevent Enemy Use) for information and instructions on destruction of equipment to prevent enemy use.



SHIPPING DIMENSIONS

LENGTH	20 INCHES
WIDTH	17 INCHES
HEIGHT	46 INCHES
WEIGHT	230 POUNDS

ME 4120-307-15/1-1

Figure 1-1. Air conditioner, left front, with shipping dimensions.

Page 1-5. Refer to line 3 of paragraph 1-4a (6) and delete "eight pounds of".

Page 1-6. Refer to paragraphs 1-4b (26) and change "Refer to figure 1-4 for the wiring diagram." to read "Refer to figures FO-1 and FO-2 for the wiring diagrams."

So much of paragraphs 1-4b (26), Table 3-2, 3-15, 3-16, 3-24 through 3-42, 3-51c (3), 7-14 and Table

3-2 as reads "fig. 1-4" is changed to read "fig. FO-1."

Page 1-7. Figure 1-4 is superseded as follows:

Figure FO-1. Wiring diagram.
(Located in back of manual)

Page 1-9. Figure 1-6 is superseded as follows:

Figure FO-2. Schematic wiring diagram.
(Located in back of manual)

Page 3-5. Figure 3-4 is superseded as follows:

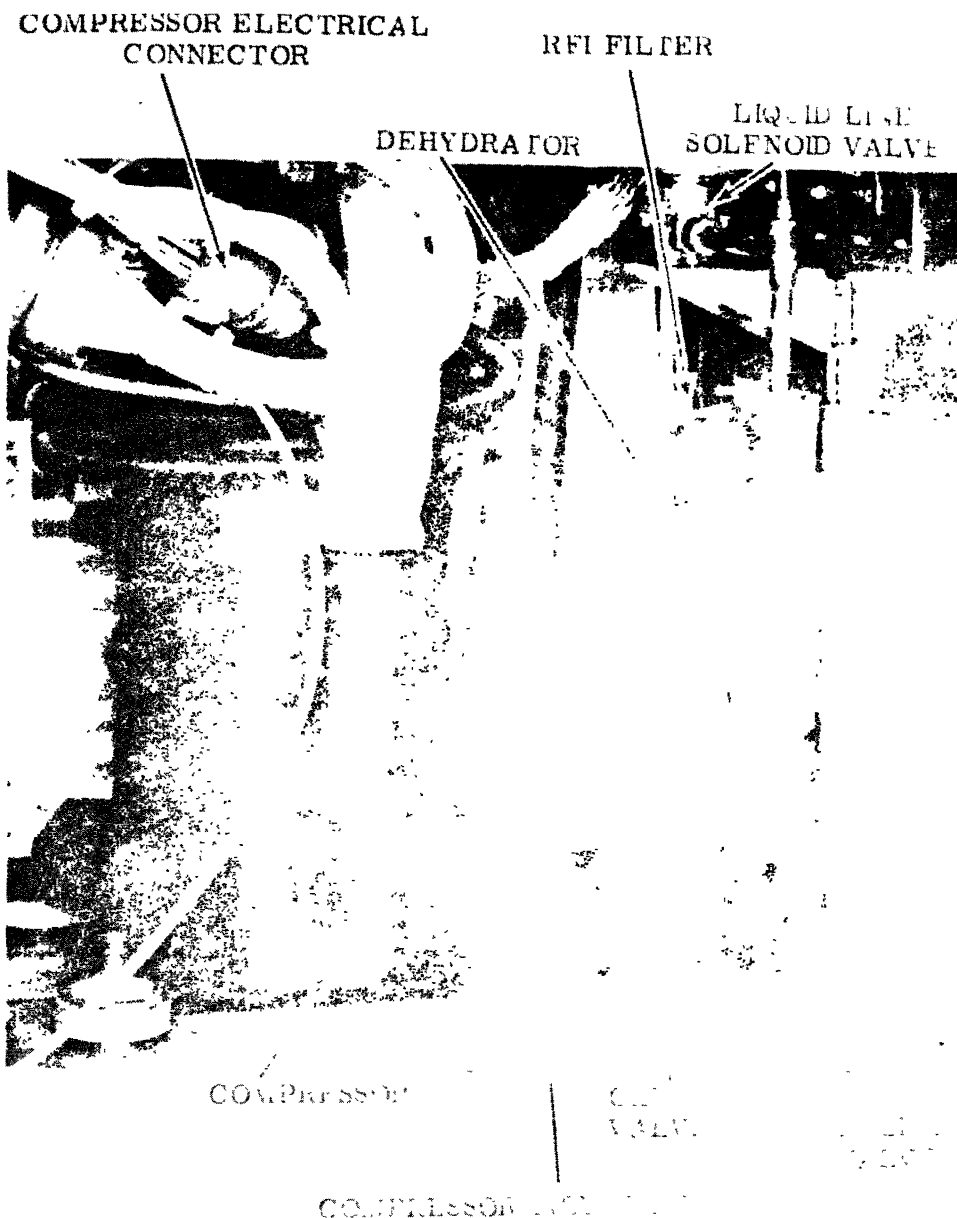
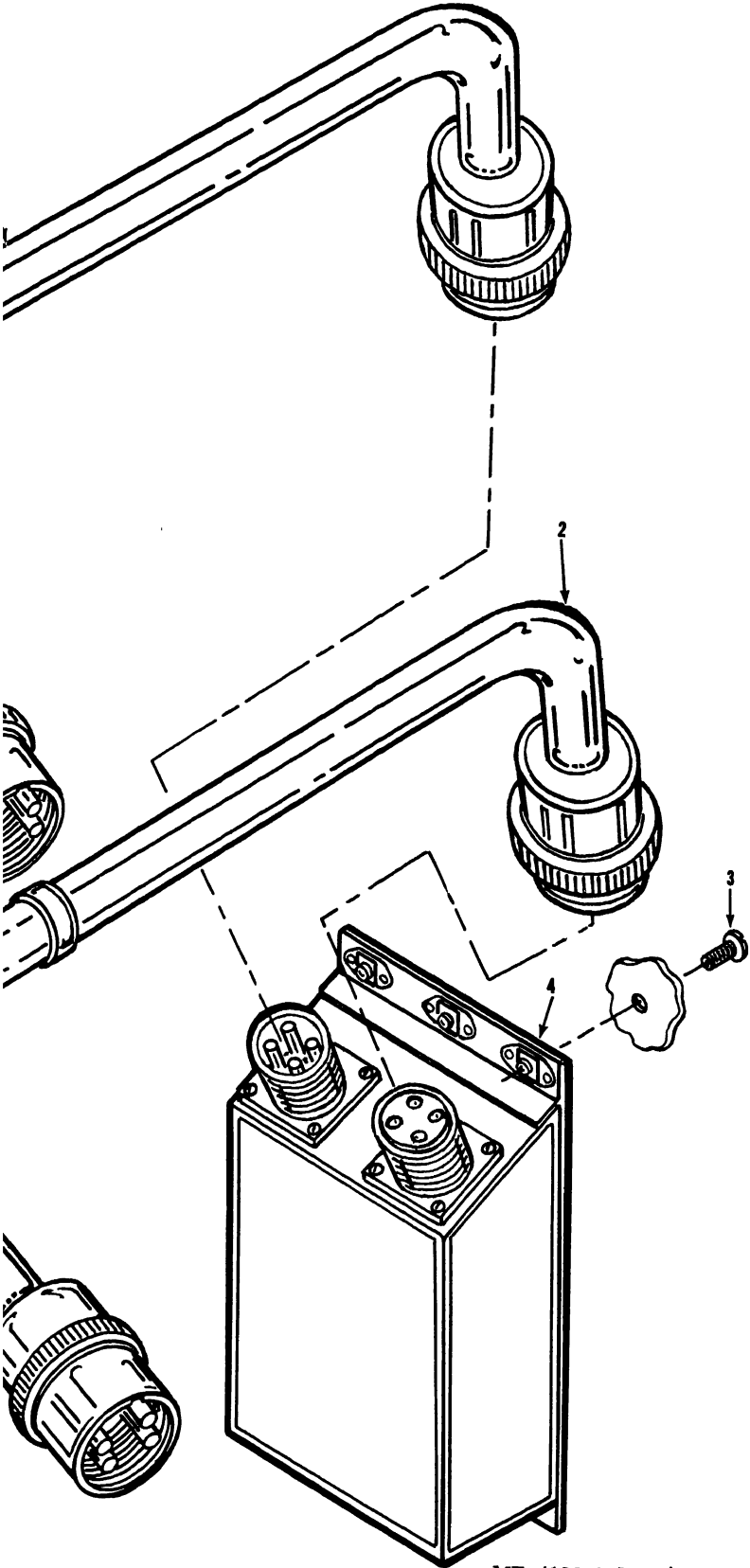


Figure 3-4. Serviceable components location
(compressor section).

ME 4120-307-15/3-4

ded as follows:



ME 4120-307-15/3-6.1

3-6.1. RFI filter, removal and installation.



[REDACTED]

Page 3-17. Subparagraphs *c* and *d* are added to paragraph 3-40 as follows:

c. Removal. Refer to figure 3-4.

(1) Remove cables (1 and 2, fig. 3-6.1) from filter receptacle.

(2) Remove six screws (3) and remove filter (4).

d. Installation. Refer to figure 3-4.

(1) Place filter in its proper position and se-

cure with six screws (3, fig. 3-6.1).

(2) Connect cables (1 and 2) to filter receptacle.

Page 3-21. Refer to the titles of paragraphs and 3-48b and change "(fig. 3-12)" to read 3-6.1 and fig. FO-1."

Paragraph 3-48a (2) "from connector J2." to connector J10."

Page 3-27. Figure 3-16 is superseded as follows:

DRAIN TUBE CLAMP



RECEIVER

CONDENSATE DRAIN TUBE

ME 4120-307-15/3-16

Figure 3-16. Condensate drain, removal and installation.

Page 5-1 thru 5-3. Chapter 5 is rescinded.

Page 6-1. In paragraph 6-4, the second sentence is changed from "A wiring diagram (fig. 1-4) and refrigeration diagram (fig. 1-5) are also included." to read "Wiring diagrams (fig(s). FO-1 and FO-2) and refrigeration diagram (fig. 1-5) are also included."

Page 6-2. In paragraph 6-4k, change "Refrigerant charge. .8 lbs." to read "Refrigerant charge. .11 lbs."

In paragraph 6-4u, first sentence, change "Figure 1-4 shows a wiring diagram of the air conditioner while figure 1-5 illustrates a refrigerant flow diagram." to read "Figures FO-1 and FO-2 show wiring diagrams of the air conditioner while figure 1-5 illustrates a refrigerant flow diagram."

Page 6-4. In Table 6-2, change title from "Table

6-2. Normal Operating pressures" to read "Normal Operating Pressures Fan Speed on High."

Page 7-4. Refer to fourth line in paragraph 7-4 (4) and change "8 lb. charge" to read "11 lb. charge."

Paragraph 7-4e (5). Change "(5) Operate unit in cool position only during servicing operation." to read "(5) Operate unit in cool position only during servicing operation with fan speed switch on high."

Figure 7-3. Change caption of figure to read as follows:

Figure 7-3. *Discharge pressure for ambient temperature range, fan speed on high.*

Paragraph 7-5a.1 is added as follows:

a.1 To prevent the formation of harmful copper oxide, continually pass dry nitrogen through the tubing or connections being soldered.

age 7-20. Figure 7-13 is superseded as follows:

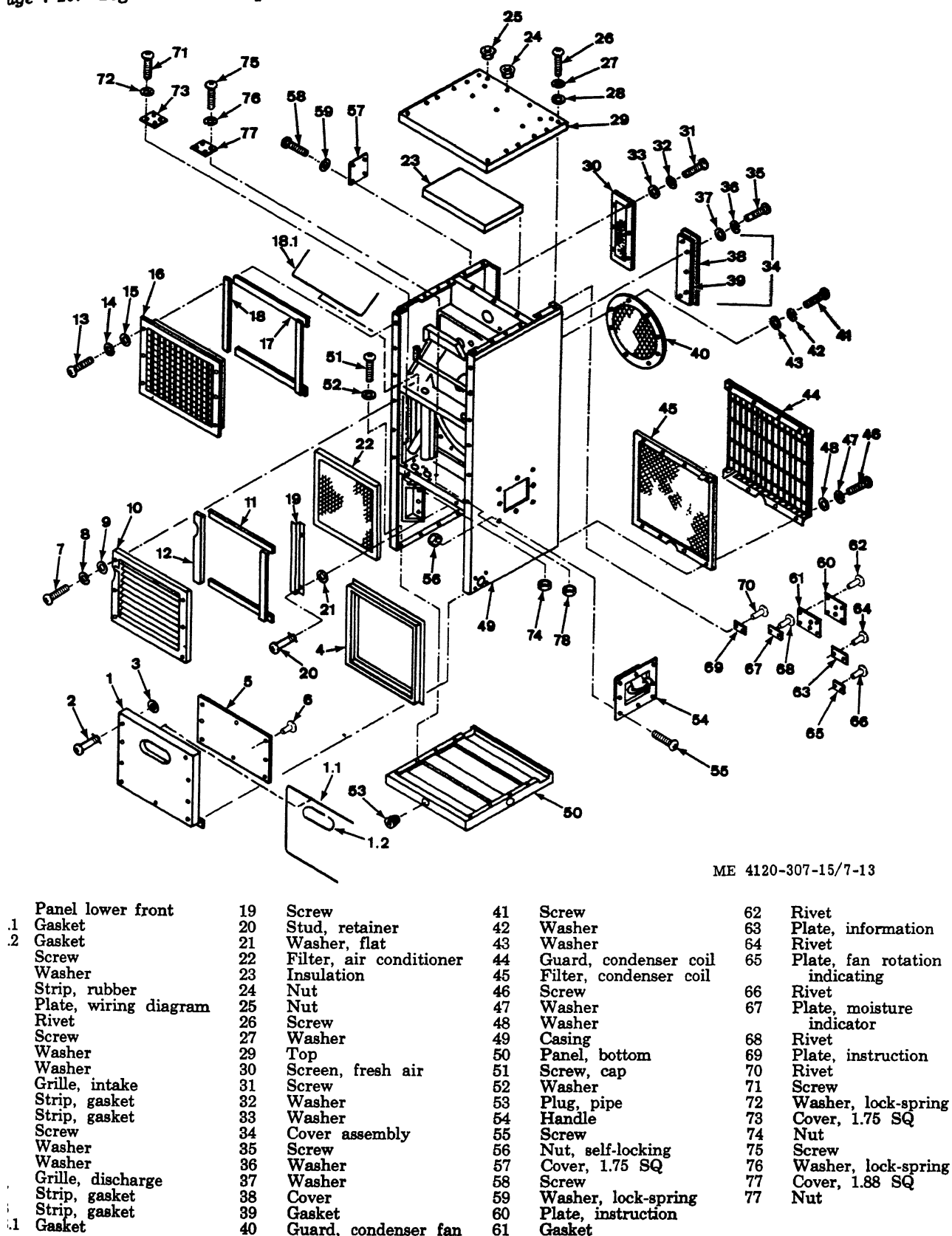


Figure 7-13. Casing assembly, exploded view.

including three items contained in this group are
rescinded in their entirety.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-25, Section III, (qty rqr block no. 542) Organizational maintenance requirements for Air Conditioners, 18,000 BTU Compact.

**OPERATOR, ORGANIZATIONAL, DIRECT
SUPPORT, GENERAL SUPPORT AND DEPOT
MAINTENANCE MANUAL**

**AIR CONDITIONER, VERTICAL;
COMPACT, 208 VOLTS, A.C. 400 HERTZ, THREE PHASE,
18,000 BTU/HR COOLING, 12,000 BTU/HR HEATING,
(KECO MODEL F18T4-2)
FSN 4120-168-1775**

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	IX.	Hose clamps, hoses, tube retaining straps, pipe plugs, receptacle hole covers, tube clips and condensate drains	3-52-3-54 3-27
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INTRODUCTION

Section I. GENERAL

-1. Scope

a. This manual is published for use of personnel whom Keco Model F18T4-2 air conditioners are issued. Chapters 1 through 3 provide information on operation, preventive maintenance services, and organizational maintenance of the equipment. Chapter 4 provides information on material used in conjunction with the major items. Chapter 5 contains instructions on shipment and storage and Chapters 6 and 7 present instructions for direct support, general support and depot maintenance instructions.

b. Numbers in parentheses on illustrations indicate quantity. Numbers preceding nomenclature layouts on illustrations indicate the preferred maintenance sequence.

c. Report all equipment improvement recommendations as prescribed by TM 38-750.

1-2. Forms and Records

a. DA Form 2258 (Depreservation Guide of Engineer Equipment).

b. For other record and report forms applicable to the operator and organizational maintenance, refer to TM 38-750.

Note. Applicable Forms, excluding Standard Form 46 (United States Government Motor Vehicles Operator's Identification Card) carried by the operator, will be kept in a canvas bag mounted on the equipment.

c. DA Form 2028 (Recommended Changes to Publications) will be used for reporting discrepancies and recommendations for improving this equipment publication. This form will be completed by the individual using this manual and forwarded direct to Commanding General, U.S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Boulevard, St. Louis, Mo. 63120.

Section II. DESCRIPTION AND DATA

-3. Description

a. *General.* The air conditioner (fig. 1-1) is used primarily in van type enclosures for providing filtered, conditioned, or heated air as required to maintain service conditions necessary for the efficient operation of electronic equipment and for the comfort of operating personnel housed within the specified vans. It is a completely self-contained, air cooled, electric motor driven unit designed for continuous operation with varying loads. It is equipped with internal ducting to the rear side of the evaporator fan so that ventilation air from a chemical and biological filter may be supplied by the evaporator fan.

b. *Condensing Section.* The condensing section, located at the bottom and rear of the unit, contains a hermetically sealed compressor, condensing coil, condenser air intake opening, condenser air discharge opening, control panel, junction box, thermostat switch, power receptacle connector, condenser fan, fan motor, dehydrator, suction and discharge service valves, and solenoid valves.

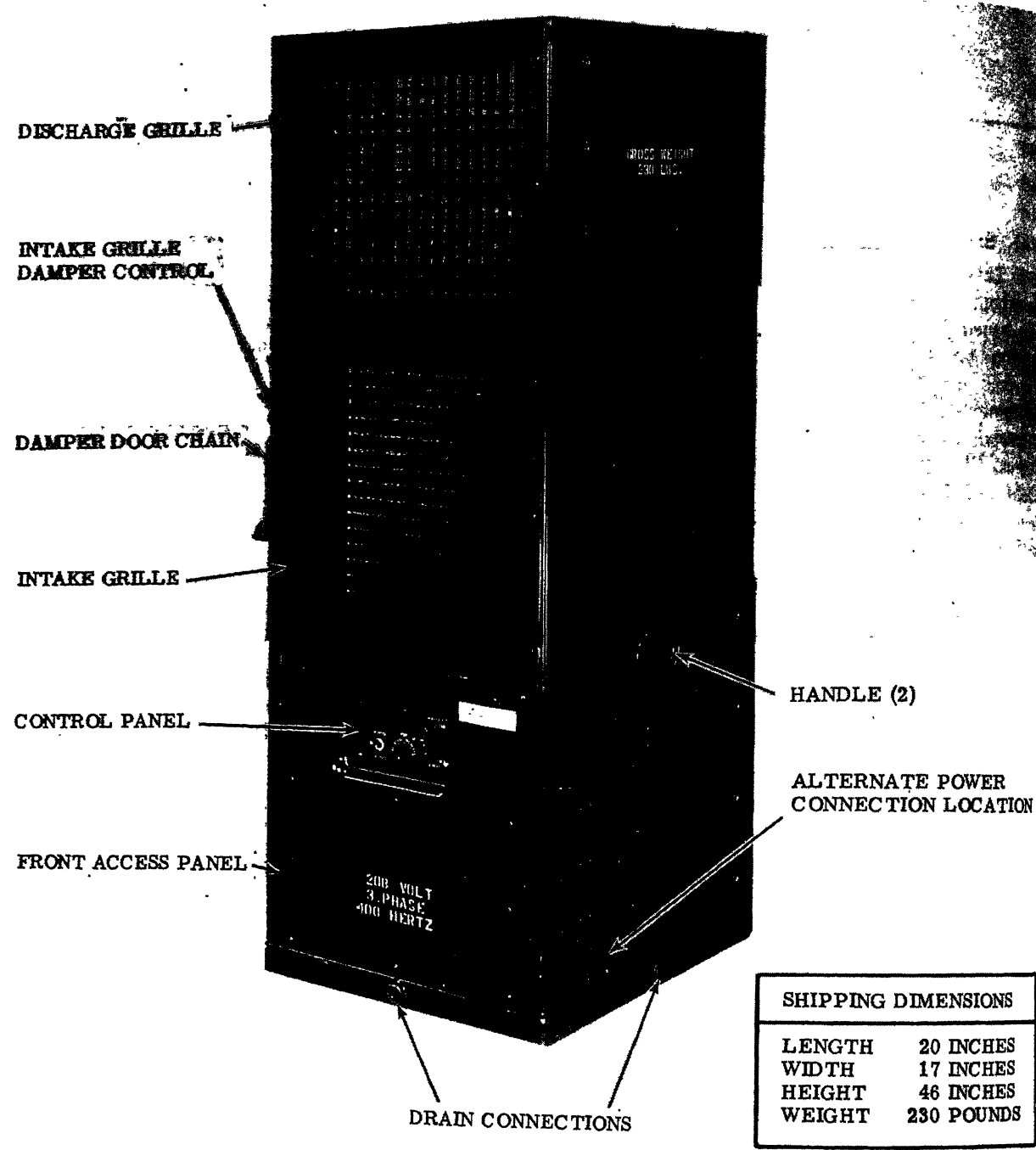
c. *Evaporator Section.* The evaporator section, located in the top and front of the unit, contains an evaporator coil, evaporator fan, air conditioning filter, intake and discharge grilles, condensate drain pan, expansion valves, electrical heaters, sightglass, and a damper to regulate the amount of outdoor air entering the air conditioner.

1-4. Identification and Tabulated Data

a. *Identification.* The air conditioners have twelve major identification and instruction plates. Information contained on these plates is listed below:

(1) *Air conditioner identification plate.* Located near top of rear panel. Specifies nomenclature, military model number, federal stock number, manufacturer's model number, serial number, specification number, part number, contract number, data, weight and capacity.

(2) *Compressor identification plate.* Located on the front of compressor housing. Specifies compressor model number, part number, serial



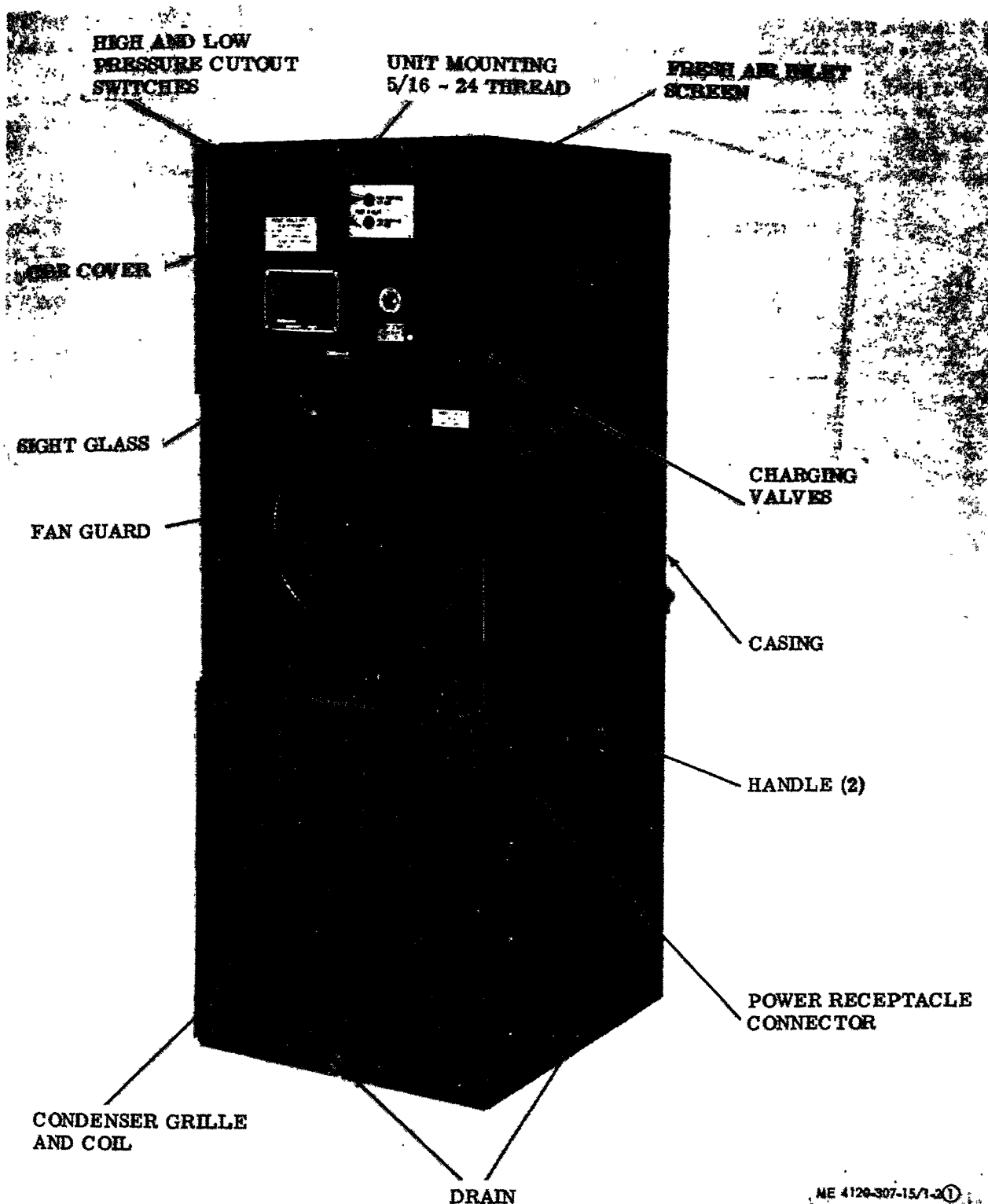
ME 4120-307-15/1-1

Figure 1-1. Air conditioner, left front with shipping dimensions.

number, refrigerant, oil type and capacity, manufacturer and complete electrical data.

(3) *Fan motor identification.* Located on top of the fan motor. Specifies motor horsepower, serial number, rpm (revolutions per minute), and electrical characteristics.

(4) *Control panel legend plate.* Located on the front of the unit control panel. Indicates unit temperature setting for cooling or heating purposes, mode selector switch and fan motor speed switch.



NE 4120-307-15/1-2①

Figure 1-2. Air conditioner (sheet 1 of 2).

NOTE: REMOVE AIR INTAKE AND DISCHARGE GRILLES.

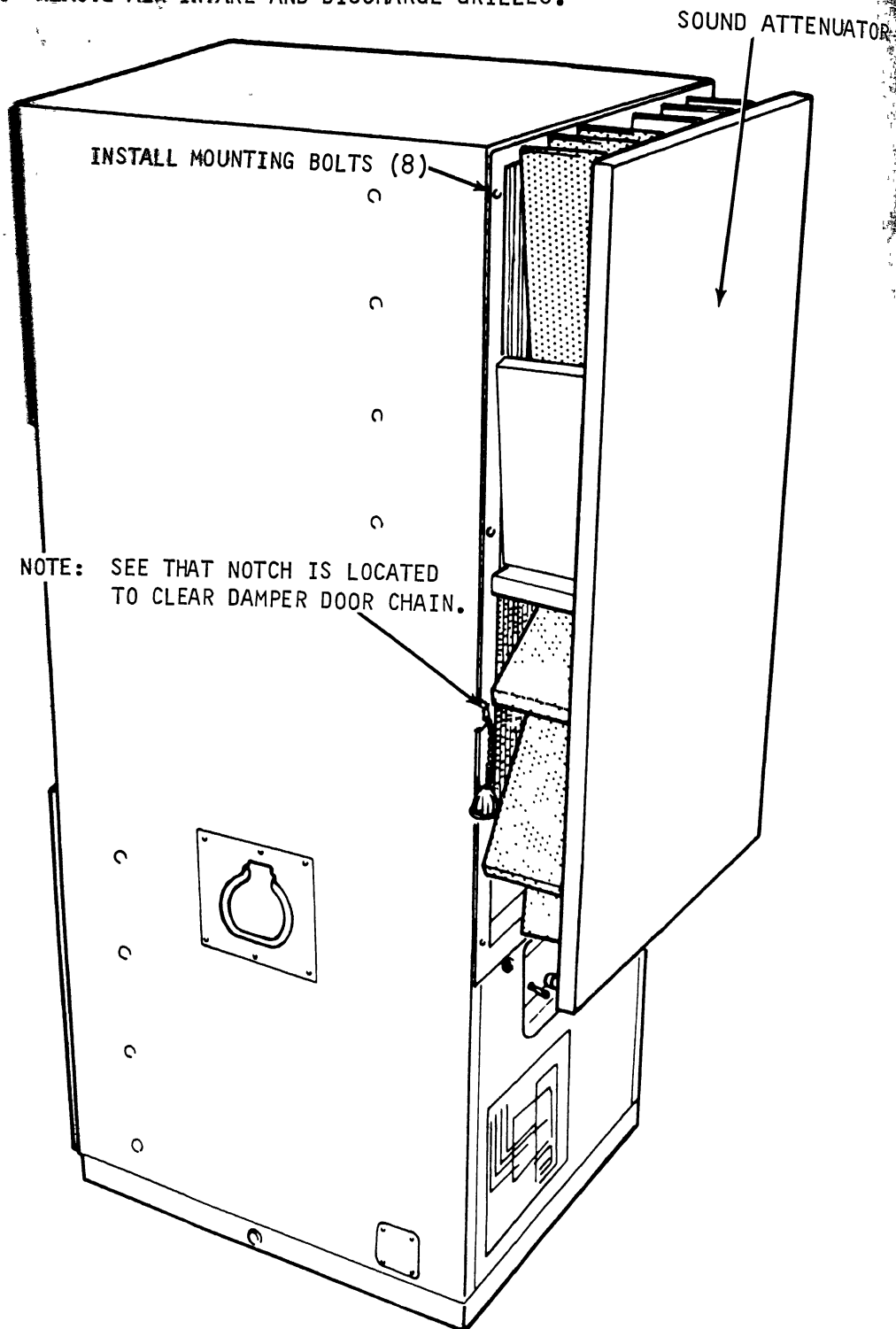


Figure 1-2. Air conditioner (sheet 2 of 2).

ME 4120-307-15/1-2(2)

(5) *Wiring diagram plate.* Located on inside of front access panel, illustrates complete unit wiring.

(6) *Refrigerant-22 plate.* Located on the rear panel above condenser fan guard. It states that the unit is charged with *eight* pounds of Refrigerant 22.

(7) *Color indicating plate.* Located on the rear panel immediately below the refrigerant sight glass. It has three color bands: green, chartreuse, and yellow which are used in conjunction with the liquid sight line glass to indicate moisture condition of the refrigerant.

(8) *High and low pressure cutout control reset plate.* Located on rear panel at the high and low pressure cutout control reset buttons with nomenclature: PUSH TO RESET.

(9) *Indicating arrow plate.* Located on the rear panel just above the condenser fan guard; the arrow indicates direction of condenser fan rotation.

(10) *Compressor reset plate.* Located behind the return air grille. It states: "COMPRESSOR CIRCUIT BREAKER. PULL UP TO RESET".

(11) *Circuit breaker instruction plate.* Located on the lower front panel. It states: "REMOVE INLET AIR GRILLE AND FILTER FOR ACCESS TO CIRCUIT BREAKER".

(12) *Service gage plate.* Located below the fresh air inlet screen on the rear panel. It states: "REMOVE SCREEN TO INSTALL SERVICE GAGES".

b. Tabulated Data.

(1) *Air conditioner identification plate.*

Air Conditioner -----Vertical, compact, Military
Model CE20VAL 4-208, Keco
Model F18T4-2 Specification
MIL-A-52344B (ME), Class
3, 208 Volts A.C., 400 Hertz,
3 phase.

Capacity -----18,000 BTU/HR
Stock Number -----FSN 4120-168-1775
Part Number -----91000
Manufacturer -----Keco Industries, Inc.

(2) *Evaporator and condenser fan motor.*

Manufacturer -----Welco Industries
Part Number -----4725-13
Hp (Horsepower) -----1-6/19
Type -----Double extended shaft
Volts -----208
Amp (amperes) -----8.2/4.2
Frequency -----400 Hertz
Phase -----3
RPM -----3800/1900
Duty -----Continuous
Drive -----Direct

(3) *Performance data.*

Cooling Capacity -----18,000 BTU/HR nominal 20,000
BTU/HR actual at 125° F DB
(51.67°C), Air to Condenser,
90° F DB (32.22°C), 75° F WB
(23.89°C), return air to unit.
Heating Capacity -----12,000 BTU/HR (hi-heat and hi-
speed positions) 6,000 BTU/
HR (lo-heat and hi-speed posi-
tions).

(4) *Dimensions and weight.*

Length -----20 in.
Width -----17 in.
Height -----46 in.
Weight -----230 lbs.

(5) *Evaporator and condenser fans.*

Manufacturer -----Keco Industries, Inc.
Type -----Condenser-propeller Evaporator-
centrifugal
Number per unit -----1 each
Rotation (facing con-
denser air dis-
charge grille) -----Clockwise

(6) *Compressor and heater contactors.*

Manufacturer -----Cutler-Hammer
Part Number -----MS24192-D1
Amp -----25
Type -----Three pole, single throw
normally open
Coil voltage -----28 VDC

(7) *Thermostat control.*

Manufacturer -----Penn Controls
Part Number -----A19AGF-10
Action -----Single pole, double throw
Range -----+40° F (4.4°C) to
90° F (32.22°C)
Electrical rating -----120 VAC

(8) *Selector switch.*

Manufacturer -----Cutler-Hammer
Type -----Rotary (manual)
Part Number -----8912K261
Number of positions -----5 (hi-heat, lo-heat, off, ventilate,
cool)
Electrical rating -----15 amp, 250 VAC

(9) *Fan speed switch.*

Type -----Single pole
Part Number -----MS35058-22
Position -----UP-Hi speed
DOWN-lo speed
Electrical Rating -----6 Amps at 208v

(10) *Heater thermostat.*

Manufacturer -----Metals and Controls, Inc.
Type -----Klixon MWA-1256 automatic
reset
Electrical rating -----208 V, 60 and 400 Hertz, 3
phase resistive load
Contacts open -----194° F (90°C)
Contacts close -----141.8° F (61°C)

(11) *Electric heaters.*

Manufacturer ----- General Electric Co.
Type ----- Stainless steel sheath
Part Number ----- 13211E8353-1
Voltage ----- 120 V
Watts ----- 600
Number per unit ----- 6

(12) *Circuit breaker.*

Manufacturer ----- Heinemann Electric
Hold amperes ----- 23
Trip amperes ----- 23.8
Type ----- Manual reset
Auxiliary switch ----- Single pole-double throw
Phase ----- 3
Frequency ----- 400 Hertz

(13) *Transformer, control voltage.*

Manufacturer ----- Reid Hill Electronics
Primary Volts ----- 208
Frequency ----- 400 Hertz
Secondary volts ----- 30
Ampere output ----- 2.2
Primary connections ----- H-1 and H-2
Secondary connections ----- X-1 and X-2

(14) *Rectifier, silicon diode.*

Manufacturer ----- Syntron
Type ----- Bridge-hermetically sealed
Peak reverse voltage
(minimum) ----- 200
Input (maximum) ----- 141 Volts AC
Forward current
(maximum at 104°
F 40°C) ----- 3 amp
Part Number ----- ERF212B1

(15) *Diode, semi-conductor.*

Manufacturer ----- General Electric
Type ----- Silicon-hermetically sealed
Peak reverse voltage
(minimum) ----- 375 volts
Allowable rms
voltage (mini-
mum) ----- 250 volts
Maximum voltage
drop (full load) ----- 0.5 volts
Maximum forward
current ----- 2.0 amp
Part Number ----- IN1695

(16) *Control relays K1 and K2.*

Manufacturer ----- Military Standard
Part Number ----- MS24192-D1
Coil voltage ----- 28 dc
Coil current amp ----- 0.5
Contact type ----- 3 pole single throw
Contact rated load
200 volts, 400
Hertz ----- 25 amp

(17) *Time delay relay K3.*

Manufacturer ----- Dialtron
Part Number ----- FR-30S-NO-24
Heater voltage ----- 24
Heater current, amp ----- 4 watts
Contact type ----- Single pole single throw
Time delay ----- 30 seconds
Contact rated load ----- 3 amp at 28 volts dc

(18) *Armature relays K4 and K5.*

Manufacturer ----- Potter and Bromfield
Part Number ----- PM17D
Coil voltage ----- 28 volts dc
Coil resistance ----- 132 ohms
Contact type ----- 4 pole double throw
Contact rated load ----- 8.5 amp

(19) *Phase sequence relay K6.*

Manufacturer ----- Hi-G Inc.
Part Number ----- 1410-1B
Coil voltage ----- 208
Coil power ----- 6 watts
Contact type ----- Single pole, double throw
Contact rated load,
208 volts, 400
Hertz ----- 0.25 amp

(20) *Temperature control thermostat S2.*

Manufacturer ----- Penn Controls
Part Number ----- A19AGF-10
Switch type ----- Single pole double throw
Range ----- +40°F to +90°F (+4.44°C to
+32.22°C)
Differential ----- 1.75°F (0.98°C)

(21) *Heaters, electrical.*

Manufacturer ----- General Electric
Type ----- Tubular
Voltage ----- 120
Wattage ----- 600

(22) *Heater thermostat S4.*

Manufacturer ----- Metals and Controls, Inc.
Part Number ----- MWA 1256
Type ----- Klixon
Voltage ----- 208
Frequency ----- 400
Contacts open ----- 194°F (90°C)
Contacts close ----- 141.8°F (61°C)

(23) *Rotary switch S1.*

Manufacturer ----- Culter-Hammer
Type ----- Four wafer, five position
Part Number ----- 8912K261
Contact rating
(resistive) ----- 15 amp, 250 volts ac
Indexing ----- 45 degrees

(24) *Liquid line sight glass.*

Manufacturer ----- Sporlan Valve Co.
Type ----- SA-K13

(25) *Base plan.* Refer to figure 1-3 for the base plan.

(26) *Wiring diagram.* Refer to figure 1-4 for the wiring diagram.

(27) *Refrigeration fluid diagram.* Refer to figure 1-5 for the refrigeration fluid diagram.

(28) *Fuse.*

Manufacturer -----Bussman
Type -----KAW5
Rating -----5 amperes

(29) *Fuse.*

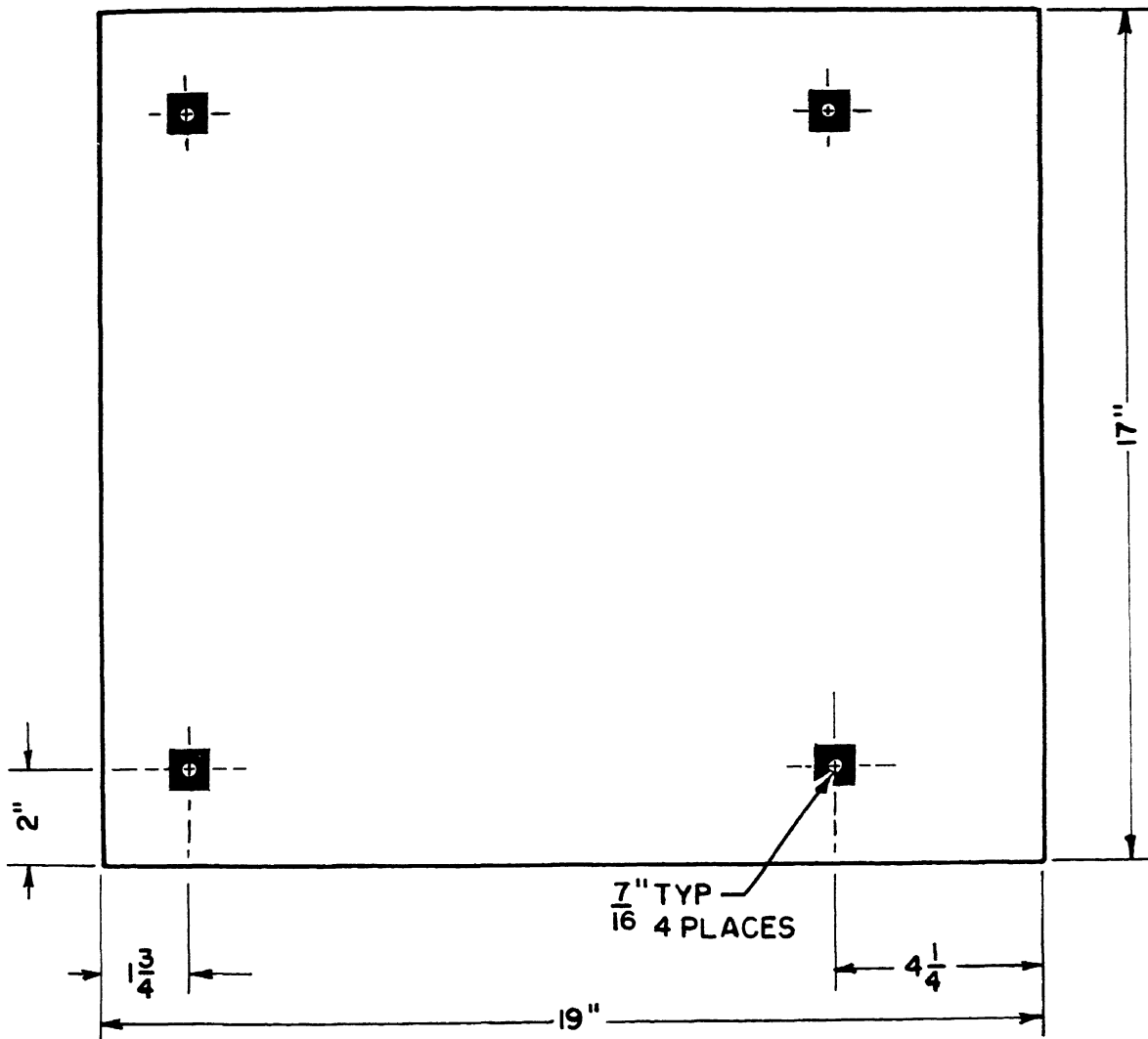
Type -----F09B250V1 6/10A
Specification -----MIL-F-15160109
Rating -----1.6 amperes

(30) *Filter, radio frequency interference.*

Manufacturer -----Keco Industries, Inc.
Part Number -----91081
Voltage -----210/220
Type -----Alternating current

1-5. Difference in Models

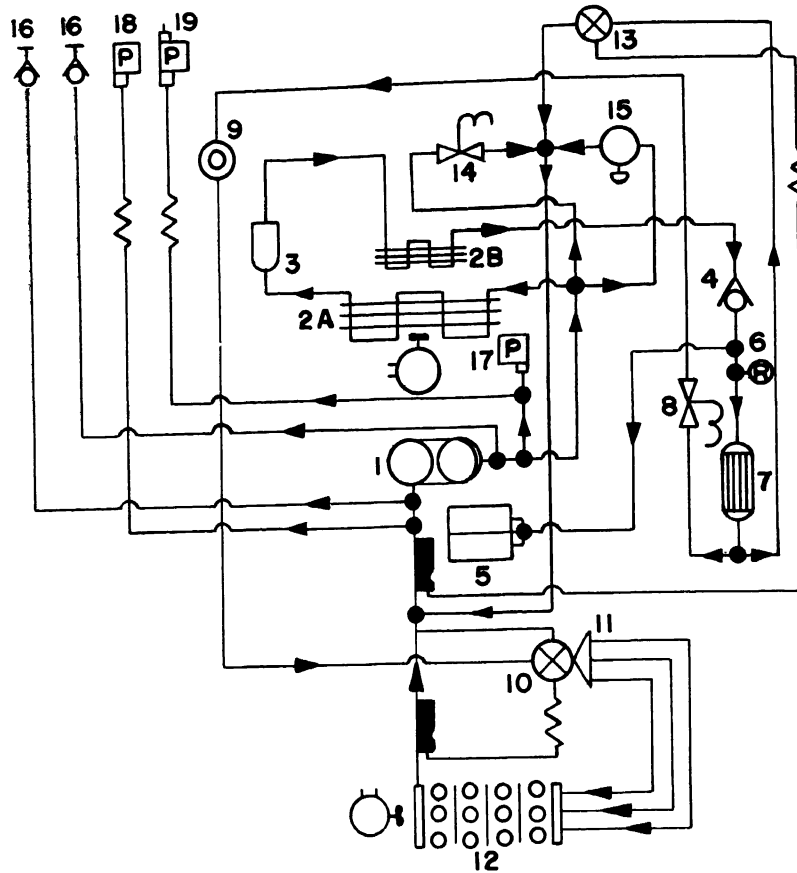
This manual covers Keco Model F18T4-2 Air Conditioner, Serial Nos. 68492 through 68757. This manual covers the above model and serial numbers only—no other model covered by this manual.



ME 4120-307-15/1-3

Figure 1-3. Base plan.

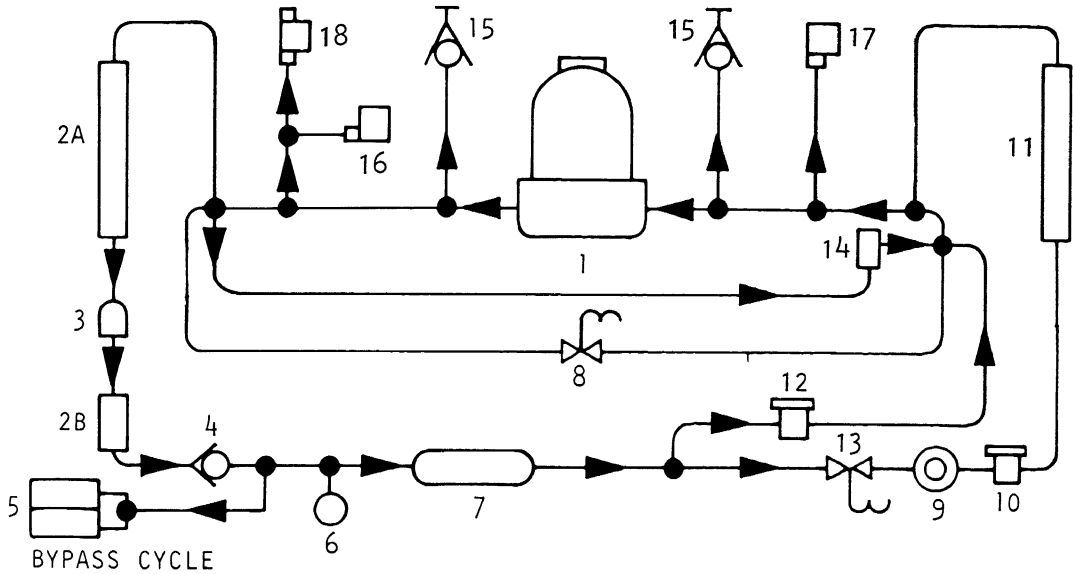
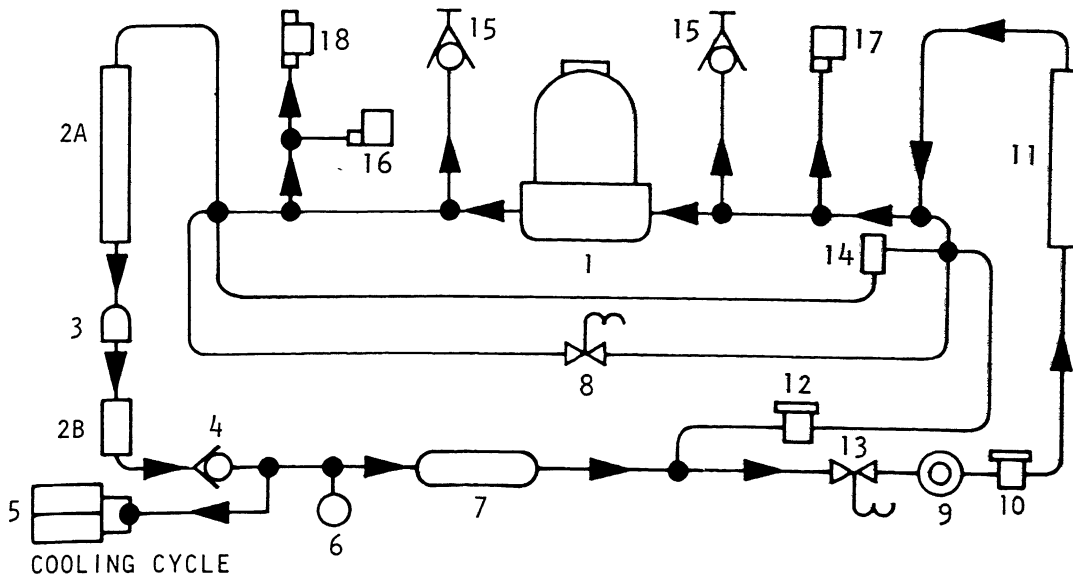
Figure 1-4. Wiring diagram.
(Located in back of manual)



1. COMPRESSOR
- 2A. COIL, CONDENSER
- 2B. SUBCOOLER
3. RECEIVER
4. VALVE, CHECK
5. TANK
6. VALVE, PRESSURE RELIEF
7. DEHYDRATOR, DESICCANT, REFRIGERANT
8. WIRING ASSEMBLY, VALVE, SOLENOID
9. GLASS, SIGHT
10. VALVE, EXPANSION
11. RESTRICTOR, FLUID FLOW
12. COIL, EVAPORATOR
13. VALVE, EXPANSION
14. WIRING ASSEMBLY, VALVE, SOLENOID
15. REGULATOR, FLUID PRESSURE
16. VALVE, CHARGING WITH CAP
17. SWITCH, PRESSURE
18. SWITCH, PRESSURE
19. SWITCH, HIGH PRESSURE CUTOUT

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Figure 1-5. Refrigeration fluid diagram (sheet 1 of 2).



- | | |
|---------------------------------------|--|
| 1 COMPRESSOR | 10 VALVE, EXPANSION, EVAPORATOR |
| 2A COIL, CONDENSER | 11 COIL, EVAPORATOR |
| 2B SUBCOOLER | 12 VALVE, EXPANSION, COMPRESSOR BYPASS |
| 3 RECEIVER | 13 VALVE, SOLENOID, COMPRESSOR BYPASS |
| 4 VALVE, CHECK | 14 REGULATOR, FLUID PRESSURE |
| 5 TANK | 15 VALVE, SERVICE WITH CAP |
| 6 VALVE, PRESSURE RELIEF | 16 SWITCH, PRESSURE, FAN SPEED |
| 7 DEHYDRATOR, DESICCANT | 17 SWITCH, LOW PRESSURE CUTOUT |
| 8 VALVE, SOLENOID, PRESSURE EQUALIZER | 18 SWITCH, HIGH PRESSURE CUTOUT |
| 9 GLASS, SIGHT | |

ME 4120-307-15/1-5②

Figure 1-5. Refrigeration fluid diagram (sheet 2 of 2).

Figure 1-6. Wiring schematic diagram.
(Located in back of manual)



CHAPTER 2

INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIAL

2-1. Inspecting and Servicing Equipment

- a. Perform daily, weekly, monthly and quarterly preventive maintenance services (table 3-1).
- b. Inspect entire air conditioner for signs of damage, paying particular attention to tubing, evaporator and condenser coils and fans.
- c. The air conditioner contains a full charge of refrigerant and compressor oil. No further service is required.

2-2. Installation of Separately Packed Components

- a. *General.* The air conditioner is basically a self-contained unit; however, in certain installations it may become desirable to utilize the remote control blockoff plate with the electrical receptacle.
- b. *Blockoff Plate.* The blockoff plate is provided for installation when the control panel assembly is removed for remote control operation. The blockoff plate provided must be used so that no air will enter the lower compartment. Refer to figure 2-1, and install the blockoff plate.

2-3. Installation or Setting Up Instructions

- a. *General.* Set air conditioner in a level position to allow proper condensate draining (operation will be satisfactory with the unit setting at a slight angle, not exceeding 5°, and using one of the four alternate drain connections).
- b. *Locating the Unit.* The front access panel, discharge and intake grilles are removable for normal service and maintenance, and must be unobstructed to permit maximum unit capacity. Condenser air enters and leaves the rear of the unit.
Note. Remove discharge and intake grilles and filter, if the unit is to be used with ducts carrying air to and from the conditioned space. Install grilles and filter in the duct. If a chemical and biological filter unit is to be attached to the unit remove the intake cover (fig. 1-2).
- c. *Installing Unit.* Bolt unit to the floor or other flat surface. Refer to base plan (fig. 1-3) for dimensions. Connect drain hose (2 to 3 feet in

length) to drain connection at bottom rear of unit to lead condensate away from unit. Alternate 1/2 npt condensate drain connections are provided at both sides and front of unit. Remove the desired drain plug and install the drain hose. Support unit at top using mounting bolt (fig. 1-2).

d. Power Source.

(1) *Air conditioner.* Operates on 208 volt, 400 Hertz, 3 phase power using the mating power plug provided.

(2) *Power receptacle connector.* A receptacle is located at the rear of the unit above the condenser coil air inlet. Connect the proper electrical power supply source to this receptacle using a mating plug. Alternate electrical power connection locations are provided at both sides of the unit. Any location may be used by interchanging the power receptacle at the rear of the unit and one of the cover plates at the side of the unit. Be sure to attach the cover plate over the unused location at the rear of the unit to prevent air from being drawn through the opening.

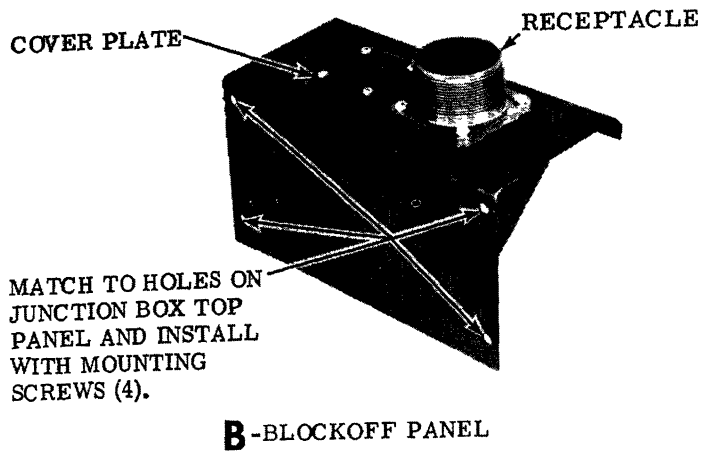
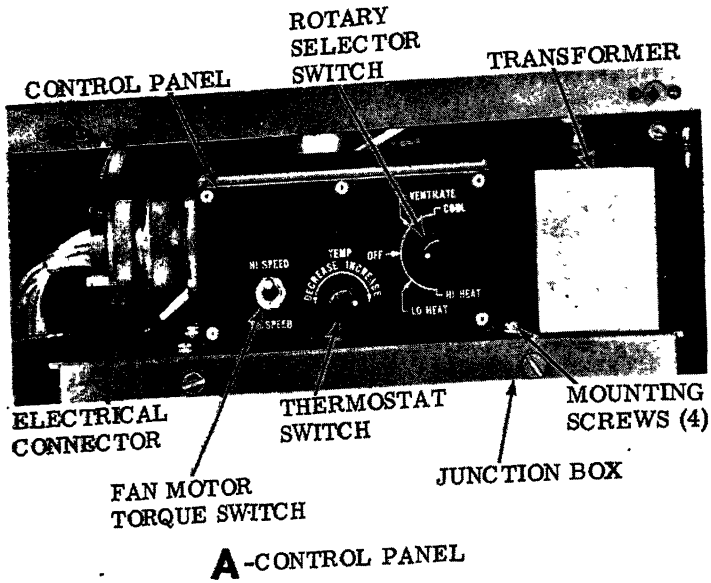
e. Remote Control.

(1) *General.* The control panel may be removed from the unit and used as a remote control for operation of the air conditioner. The remote control connection and blockoff plate provided must be used when the control panel is used as a remote control.

(2) Remote control connection.

- (a) Disconnect power source from unit.
- (b) Remove front access panel and return air grille (fig. 2-2, view 3). Disconnect the electrical connector from the control panel. Remove the air filter and thermostat remote bulb from its retaining clamp. Push the bulb through the grommet at the bottom of the bulkhead in the return air compartment.

(c) Remove four mounting screws and remove control panel. Remove the electrical receptacle from the blockoff panel (fig. 2-1). Remove the cover (view C, fig. 2-1) in thru-bulkhead of return air compartment. Install electrical receptacle in hole in thru-bulkhead. Move cover plate



NOTE: AS AN ALTERNATE METHOD OF REMOTE CONTROL CONNECTION, REMOVE THE COVER INDICATED IN THE THRU-BULKHEAD OF THE RETURN AIR COMPARTMENT. USE THIS COVER TO COVER CONNECTOR LOCATION IN BLOCKOFF PANEL. REMOVE RECEPTACLE FROM BLOCKOFF PANEL AND INSTALL IT IN BULKHEAD AT LOCATION INDICATED BY ARROW. CONNECT CABLE TO RECEPTACLE IN BULKHEAD.

C-RETURN AIR COMPARTMENT BULKHEAD

ME 4120-307-15/2-1

Figure 2-1. Remote control connection installation.

from bulkhead to cover hole left in blockoff panel where electrical receptacle was located.

(d) Roll up thermostat remote bulb and tube and store inside control panel from the rear. Connect the electrical connector (disconnected (b) above) to connector in bulkhead. Install blockoff panel with screws that mounted control

panel. Connect a cable to the receptacle in the bulkhead panel and run it to the new location of the control panel and connect the other end to the control panel receptacle. The power cable may also be relocated on the blockoff panel.

(e) Reinstall front access panel.

Section II. MOVEMENT TO A NEW WORKSITE

2-4. Dismantling for Movement

a. General.

(1) Shut off electrical power supply to air conditioner and disconnect power cable from unit.

(2) Disconnect drain hose from unit.

Note. Disconnect all duct work and remote control cable if used with unit.

(3) Unbolt unit from mounting surface.

b. *Short Distance Movement.* Use a forklift and lift the unit at base, or carry unit to new worksite using the recessed handles at sides of unit to keep the unit vertical.

c. *Long Distance Movement.* Crate the air conditioner, providing adequate protection to grilles and control panel. Refer to TM 38-250 for instructions in crate fabrication, if original shipping crate is not available. Provide suitable blocking and tie-downs to prevent unit from shifting during transfer and to keep the unit vertical.

2-5. Reinstallation after Movement

Reinstall the air conditioner as instructed in paragraph 2-3.

Section III. CONTROLS AND INSTRUMENTS

2-6. General

This section describes, locates, illustrates, and furnishes the operator, crew or organizational maintenance personnel sufficient information about the various controls to insure proper operation of the air conditioner.

2-7. Controls and Instruments

The controls and instruments on the air conditioner are listed and described in table 2-1. Figure 2-2 and figure 2-3 illustrate the controls and show their locations. The table provides the control nomenclature, its reference designation, a description of the component and a description of its function.

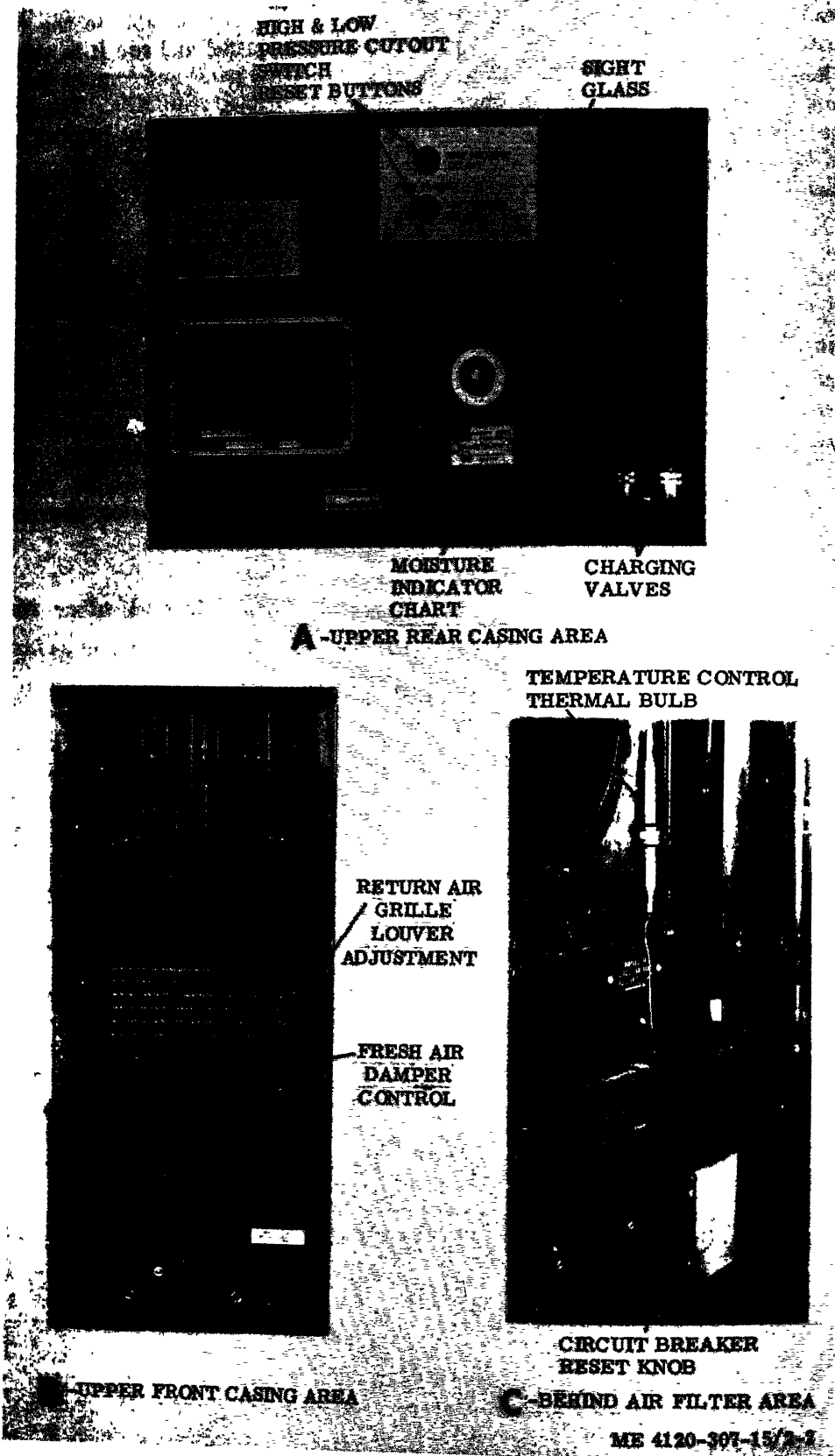
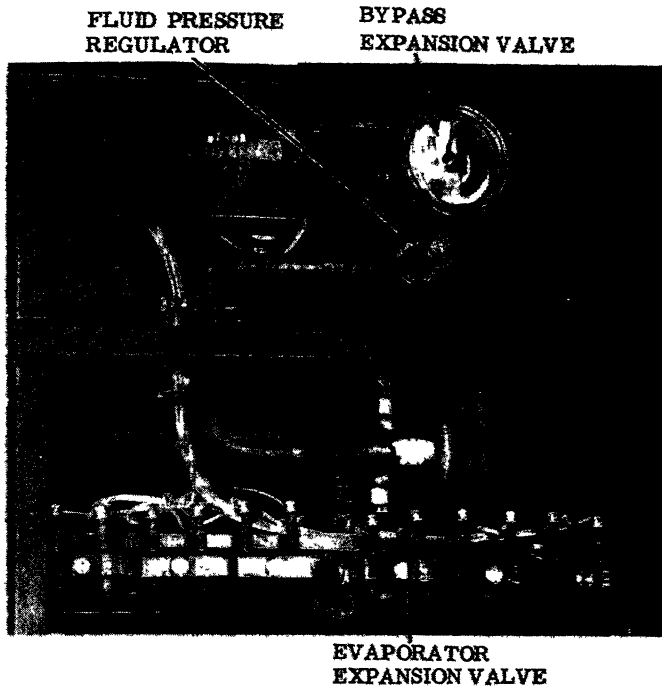
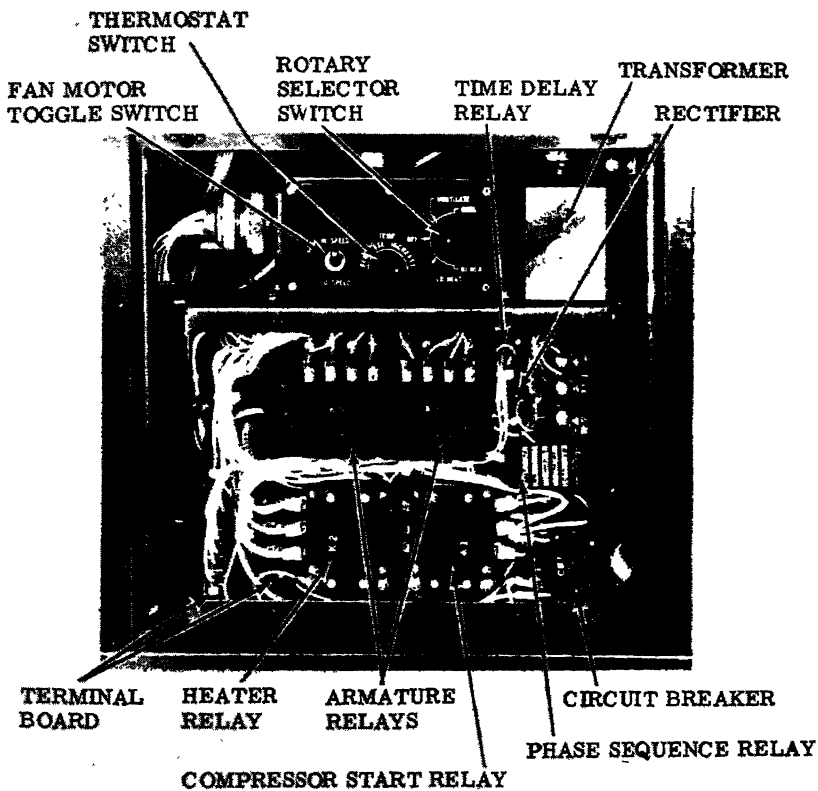


Figure 2-2. Manual controls and instruments location.



A -TOP PANEL REMOVED



B -CONTROL PANEL AND JUNCTION BOX (COVER REMOVED)

ME 4120-307-15/2-3

Figure 2-3. Electrical controls and instruments location.

Table 2-1. Controls and Instruments

Control	Reference designator	Description	Function
Circuit breaker.	CB1	Three-pole, single-throw, series-trip-type circuit breaker. Rated to trip at 28.8 amperes, 208 volts with manual reset. Circuit breaker has auxiliary switch, single-pole, double-throw contacts, rated at five amperes.	Controls 208 volts, 400 Hertz, three phase input power to the compressor motor B1. Auxiliary switch controls single phase of same input power to air conditioner control circuits.
Selector switch.	S1	Eight-pole, four-wafer, five-position rotary selector switch.	Controls the air conditioner functions as follows: COOL position: Energizes control circuits for cooling and fan drive motor. De-energizes heater control circuits. VENTILATE position: Energizes fan drive motor, deenergizes cooling and heating circuits. OFF position: Deenergizes all operating circuits, turns the air conditioner off. LO-HEAT position: Energizes primary heaters and heating control circuits. Deenergizes cooling control circuits. HI-HEAT position: Energizes primary and secondary heaters and fan drive motor, deenergizes cooling control circuits.
Temperature control.	S2	Adjustable, single-pole double-throw, action-type thermostat with range from +40 degrees to +90 degrees F. (4.4 to 32.22 degrees C.) with 1-3/4 F. (0.98 degrees C.) differential at any particular setting.	Provides for controlling the operation of either the cooling circuit or heating circuit as the temperature and selector switch setting dictate.
Fan control toggle switch.	S8	Single-pole, single-throw toggle switch.	Provides for selection of high or low speed on the fan drive motor.
Damper door control.		Pull chain attached to hinged door in the fresh air duct.	Provides for controlling the amount of fresh air intake.
Intake air control lever.		Lift chain and pull to close door.	Shuts off all fresh air intake in unit.
Sight glass.		Lever attached to hinged louvers on the intake air grille.	Provides for controlling the return air to the air conditioner.
		Refrigerant liquid line sight glass approximately 1.25 inches in diameter.	Indicates liquid line system condition. Moisture in the system is indicated by the center button changing from green (dry) to yellow (wet). A shortage of refrigerant is indicated by bubbles in the sight glass (in cooling mode only).

Section IV. OPERATION UNDER USUAL CONDITIONS

2-8. General

a. The instructions in this section are published for the information and guidance of personnel responsible for operation of the air conditioner.

b. The operator must know how to perform every operation of which the air conditioner is capable. This section gives instructions on starting, stopping, and operating details of the air

conditioner. Since nearly every application presents a different problem, the operator may have to vary given procedure to fit the individual job.

2-9. Starting

a. Perform daily preventive maintenance services (para 3-5).

b. Mode of operation must be established before starting the air conditioner (para 2-11).

c. If the air conditioner fails to start, pull the circuit breaker reset rod at the front of the unit (fig. 2-2 or 2-3). Push reset buttons on High and Low Pressure Cutout Switches.

2-10. Stopping

Place the selector switch (fig. 2-3) in the OFF position.

2-11. Operation of Equipment

a. *General.* Four basic modes of operation are provided for in the air conditioner. Instructions for each mode of operation are provided in the instructions that follow. The operator should familiarize himself with the controls and their operations as described in table 2-1 and figures 2-2 and 2-3.

b. *Cooling Mode.* To operate the air conditioner in the cooling mode, perform the following procedures in sequence:

(1) Place the selector switch in the COOL position.

(2) Rotate the temperature control to the position for the desired temperature.

(3) Select either HI or LO fan speed by placing the fan speed switch to the desired position.

(4) For cooling with fresh makeup air, open damper door and partially close intake grille louvers. For 100 percent recirculation of enclosed air, completely close the damper door. Do not completely close the intake grille, as this may damage the unit.

c. *Ventilate Mode.* To operate the air conditioner in the ventilate mode, perform the following procedures in sequence:

(1) Open the fresh air damper door. Intake air grille should be adjusted anywhere from partially closed to fully closed. Full closed provides 100 percent fresh air ventilation (pulling chain closes door).

(2) Place the fan speed switch to the desired speed for amount of ventilation.

(3) Place the selector switch to the VENTILATE position.

d. *Low Heat Mode.* To operate the air conditioner in the low heat mode, perform the following instructions in sequence:

(1) Open the intake air grille louvers.

(2) Adjust the air damper and secure the chain in slot.

(3) Place the selector switch in the LO-HEAT position.

(4) Rotate the temperature control to the position for the temperature desired.

(5) Select either HI or LO fan speed by placing the fan speed switch to the desired position.

e. *High Heat Mode.* To operate the air conditioner in the high heat mode, perform the following instructions in sequence:

(1) Open the intake air grille louvers.

(2) Adjust the air damper and secure the chain in slot.

(3) Place the selector switch in the HI-HEAT position.

(4) Rotate the temperature control to the position for the temperature desired.

(5) Select either HI or LO fan speed by placing the fan speed switch to the desired position.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

2-12. Operation in Extreme Cold

a. *General.* The air conditioner is designed to operate at a minimum low temperature of -65°F. (-53.9°C.). Be sure that all thermostatic controls and dampers are in proper position.

b. *Electrical System.* Make sure the electrical system is free of ice and moisture.

Caution: Do not disturb the wiring during cold weather unless absolutely necessary. Cold

temperatures make wiring and insulation brittle and easily broken.

2-13. Operation in Extreme Heat

a. *General.* The air conditioner is designed to operate satisfactorily at temperatures up to 125°F. (51.67°C.).

b. *Ventilation.* Allow sufficient room around the air conditioner for adequate air circulation.

Note. Do not restrict the flow of air at the intake and discharge openings of the unit.

2-14. Operation in Dusty or Sandy Areas

Clean the condenser coil and evaporator coil weekly or more often if necessary. Clean the air conditioning filter, fresh air inlet screen and condenser screen daily (para. 3-8).

2-15. Operation Under Rainy or Humid Conditions

If the unit is outside and not operating, protect it with a canvas or other waterproof material. Remove cover during dry periods. Open the front access panel to allow unit to dry before operating. Use caution when operating electrical equipment.

2-16. Operation in Salt Water Areas

Wash the exterior of the unit with clean fresh water at frequent intervals. Do not damage the electrical equipment during the cleaning operation. If the metal surfaces become exposed or corroded, coat the exposed surfaces with rust-proofing material. Remove corrosion and paint the exposed surface.

2-17. Operation in Snow

If the unit is outside and not operating, protect it with a canvas or other waterproof material. Remove cover during dry periods and open the front access panel to allow unit to dry before operating. Make sure the electrical system is free of ice and moisture.

2-18. Operation in Mud

Use the same precautions as for humid or rainy conditions. Be sure the condenser coil and evaporator coil are clean before operating. Clean the air conditioning filter, fresh air inlet screen and the condenser screen daily.

2-19. Operation at High Altitudes

If unit is being operated at high altitudes, protect it from overheating. Allow sufficient room around the air conditioner for adequate air circulation.

2-20. Operation Below Sea Level

No special instructions are required for operation below sea level, except, observe precautions of other environmental conditions present.

CHAPTER 3**OPERATOR'S AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS**

**Section I. OPERATOR AND ORGANIZATIONAL MAINTENANCE
REPAIR PARTS, TOOLS, AND EQUIPMENT****1. Special Tools and Equipment**

Special tools or equipment are required by the operator or organizational maintenance personnel.

2. Tools and Equipment

Specific issue tools and repair parts issued with or authorized for the air conditioner are listed in Appendix B of this manual.

3-3. Organizational Maintenance Repair Parts

Organizational maintenance repair parts are listed, and illustrated in TM 5-4120-307-25P (when published).

Section II LUBRICATION**4. General**

The unit is permanently lubricated and no lubrication is required during the life of the air conditioner.

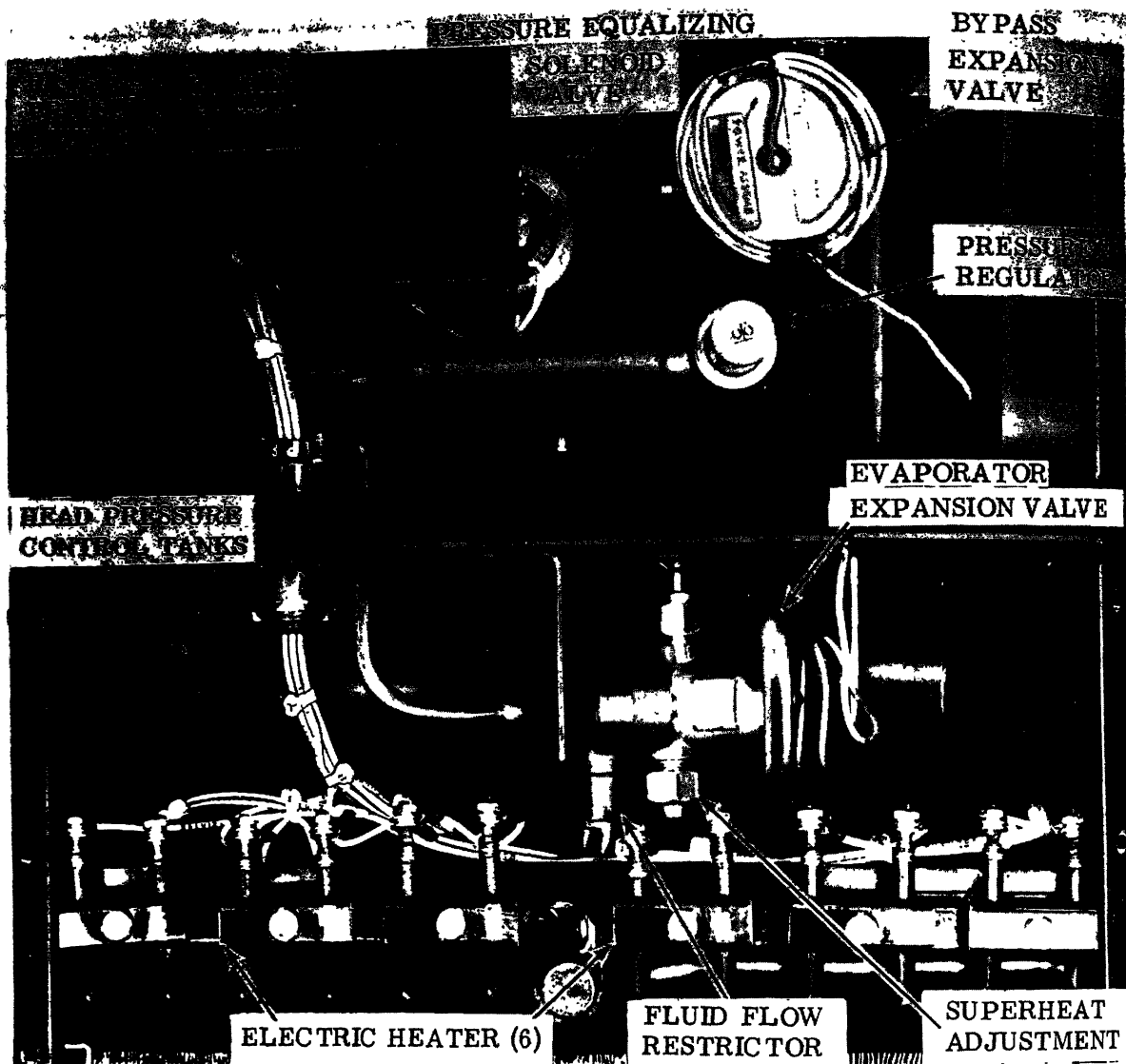
Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES**5. General**

To insure that the air conditioner is ready for operation at all times, it must be inspected systematically so defects may be discovered, and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraph 3-6 and table 3-1. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction, and be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation, which would damage the equipment through continued operation. All deficiencies and malfunctions will be recorded together with

corrective action taken on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

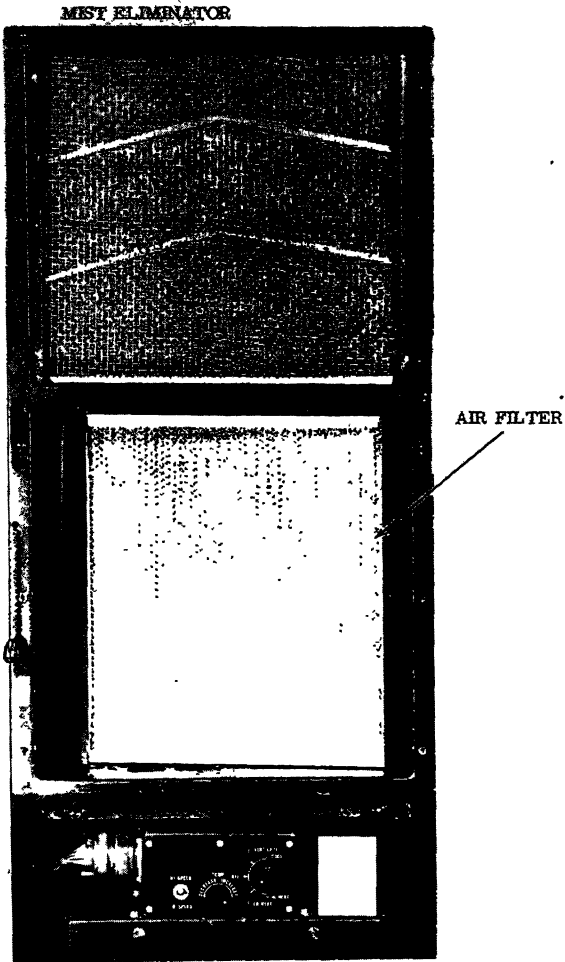
3-6. Preventive Maintenance Checks and Services

The preventive maintenance checks and services for daily, weekly, monthly and quarterly checks are provided in table 3-1. This table lists the item to be serviced by item number, shows the frequency at which it should be serviced, provides the procedure for checking each item listed and references the item to the appropriate service paragraph in this manual. Figures 3-1 thru 3-4 illustrate and locate the components to be serviced by the item number as listed in table 3-1.



ME 4120-307-15/3-1

Figure 3-1. Serviceable components location (top of unit).



ME 4120-307-15/3-2

Figure 3-2. Serviceable components location (filters).

UNIT MOUNTING
5/16-24 THREAD

CBR COVER

RESET BUTTONS

FRESH AIR INTAKE
SCREEN

CHARGING VALVES

CONDENSER FAN
GUARD AND FAN

WIGHT GLASS

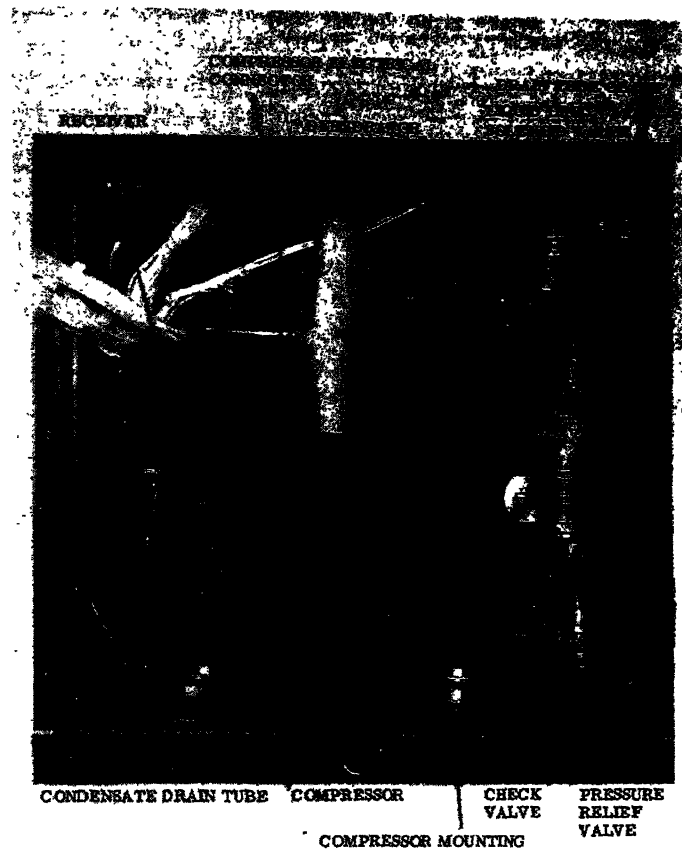
POWER
RECEPTACLE

CONDENSER COIL
AND COIL GRILLE

DRAIN PLUG

ME 4120-307-15/3-

Figure 3-8. Serviceable components location (rear of air conditioner).



ME 4120-307-15/3-4

Figure 3-4. Serviceable components location (Compressor section).

Table 3-1. Preventive Maintenance Checks and Services

Item Number	Interval						B—Before operation D—During operation	A—After operation W—Weekly	M—Monthly Q—Quarterly
	Operator				Org.				
	Daily			W	M	Q			
	B	D	A						
							Item to be inspected	Procedure	Reference
1	X						Input cable	Ensure that cable is properly connected and is free of damage or breaks.	paragraph 2-5
2	X						Intake grille damper control	Ensure that control operates grille freely.	paragraph 3-1
3	X						Damper door control chain	Ensure that control chain operates damper freely.	paragraph 3-2
4	X	X					Control panel	Ensure that control and switches operate properly.	paragraph 2-1
5		X					Circuit breaker	Ensure that circuit breaker operates air conditioner.	paragraph 2-1
6		X					Sight glass	Check sight glass for condition of refrigerant. Color indicates moisture condition and bubbles indicate low refrigerant. (cooling cycle only)	paragraph 3-1
7		X					Air flow	Check condition of air flow with hand. Condition of air flow can indicate fan operation and cooler or heater operation.	paragraph 3-8
8				X			Fresh air inlet screen	Remove screen and clean as required.	paragraph 3-1
9				X			Air conditioning filter	Remove filter and clean as required.	paragraph 3-8
10				X			Condenser screen	Remove screen and clean as required.	paragraph 3-1
11				X			Mist eliminator	Remove mist eliminator and clean as required.	paragraph 3-8
12					X		Fans	Check for looseness, vibration or any physical damage.	paragraph 3-2 and 3-22
13					X		Condenser coil	Clean and service the coil as required.	paragraph 3-9
14					X		Evaporator coil	Clean and service the coil as required.	paragraph 3-5
15					X		Fan motor	Check operation of motor in both speeds. Check for unusual noise and vibration.	paragraph 3-4
16					X		Compressor	Check compressor during operation for unusual noise, vibration and heat.	paragraph 3-1
17						X	Heaters	Place unit in high heat mode and check operation of all six heaters.	paragraph 3-1
18						X	Condensate drains	Disassemble ball check valve and service as required. Insure drain hose is installed for proper drainage.	paragraph 3-5

Section IV. OPERATOR'S MAINTENANCE

3-7. General

The instructions in this section are published for the information and guidance of the operator in maintaining the air conditioner.

Warning: Disconnect the air conditioner from the power source before performing any maintenance on the components of the air conditioner.

3-8. Mist Eliminator and Air Conditioning Filter Service

a. Removal. Refer to paragraph 3-18 and remove the cover panel, intake grille and discharge grille. Then remove the filter and the mist eliminator. Top panel (fig. 3-11) must be removed to service mist eliminator.

b. Servicing. Wash the filter and mist eliminator with dry cleaning solvent, Federal Specification P-S-661, and dry with clean, low pressure, compressed air. Dip or spray the filter with "Filterkote" or oil, Specification MIL-O-2104 Grade 20 or better. Drain off excess oil before installation. Do not oil mist eliminator.

c. Installation. Install the air filter and mist eliminator in place, then install intake grille in reverse order of removal.

3-9. Evaporator Coil and Condenser Coil Service

a. Removal. Refer to paragraph 3-18 and 3-20 and remove the discharge grille and top panel to gain access to evaporator coil and remove condenser coil grille and screen to gain access to condenser coil.

b. Servicing. Clean the surface of the coils by scrubbing with a suitable brush. Clean loose particles and between fins with compressed air.

c. Installation. Install the discharge grille and top panel over the evaporator coil and the condenser coil grille and screen in reverse order of removal.

3-10. Fresh Air Inlet Screen Servicing

a. Removal. Refer to paragraph 3-20 and remove the fresh air inlet screen.

b. Servicing. Clean the screen by blowing with compressed air in the reverse of normal air flow. Replace the screen if damaged.

c. Installation. Install the fresh air inlet screen in reverse order of removal.

3-11. Condenser Coil Screen Service

a. Removal. Remove the condenser coil grille and screen assembly (para 3-20).

b. Servicing. Wash the screen with dry cleaning solvent, Federal Specification P-S-661, and dry with clean, low pressure compressed air. Replace damaged screen.

c. Installation. Refer to paragraph 3-20 and reinstall the condenser coil grille and screen assembly.

3-12. Fuse Replacement

a. Removal. Three fuses located in the junction box assembly may be removed by lifting them from their respective fuse holders.

Warning: Disconnect power from the air conditioner before performing any service inside the junction box.

b. Servicing. Ascertain that fuses are defective by checking for high resistance with an ohmmeter. Fuses should have approximately zero ohms.

c. Installation. Replace or reinstall the fuses in their respective fuse holders. Make sure fuses are secure and tight.

Section V. TROUBLESHOOTING

3-13. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner and its components. Malfunctions which may occur are listed in table

3-2. Each malfunction stated is followed by a list of probable causes of the trouble. The corrective action recommended is described opposite the probable cause.

Table 3-2. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Compressor fails to start.	<ul style="list-style-type: none"> a. Selector switch improperly positioned. b. Circuit breaker contacts are open. c. Contacts of high or low pressure cut-out switches are open. d. Power phase input reversed. e. Phase sequence relay defective. f. No power. g. Low pressure switch does not reset. h. Control circuit inoperative. i. Compressor inherent protector open. 	<ul style="list-style-type: none"> a. Set switch to COOL position (para 2-11b). b. Reset circuit breaker (fig. 2-3 2-2). c. Push reset button to reset cut switch (fig. 2-2 or 2-3). d. Check fan rotation and if reverse refer to wiring diagram and correct phase input. e. Replace relay (para 7-12). f. Insure 208V, 3HP, 400 Hertz is supplied to air conditioner. g. Check refrigerant circuit for sign of leakage. Report to D/S, if leaks are found, and switches normal. h. Refer to figure 1-4 for electrical check points. i. Allow compressor to cool. Recheck for continuity; if still open, report to D/S.
2. Compressor starts but goes out on overload.	<ul style="list-style-type: none"> a. Condenser air or compressor pre-cooler air restricted. b. Obstructed condenser air flow, or evaporator air flow. c. Low voltage at compressor. d. Loose wires or connectors. 	<ul style="list-style-type: none"> a. Service condenser screen and compressor pre-cooler coil (para 3-1). b. Remove any item that reduces normal air flow to the condenser/evaporator. Clean all filters/screens. c. Refer to figure 1-4. Test voltage; compressor tolerance is plus minus 10% of 208V. d. Refer to figure 1-4. Check wires/connections for tightness, continuity or open or shorted conditions.
3. Little or no heating capacity.	<ul style="list-style-type: none"> e. Fan motor defective. a. Selector switch is improperly positioned. b. Air movement over the evaporator is insufficient. c. Defective heater contactor action. 	<ul style="list-style-type: none"> e. Replace motor (para 3-26). a. Set switch to low or high heat desired (para 2-11). b. Open intake grille louvers and service the mist eliminator, the air conditioning filter and evaporator (para 3-8 and 3-9). c. Test heater relay. Replace defective relay (para 7-12).
4. Reduced cooling.	<ul style="list-style-type: none"> a. Filters clogged. b. Refrigerant low or moisture present (Yellow). c. Improperly adjusted intake grille damper. d. Fan speed low, will not go high. 	<ul style="list-style-type: none"> a. Clean. b. Check sight glass for bubbles/moisture. Report to D/S. c. Open damper. d. Check fan speed pressure switch toggle switch and circuit relay; pressure switch is defective report to D/S.
5. Pressure (HI-LOW) switch trips excessively.	Refrigerant system malfunctioning.	Report to DS/GS.
6. Air conditioner excessively noisy.	Vibration of fans, motors, compressor.	Stop unit and inspect for defects.
7. Suction and discharge pressure low.	Lack of refrigerant.	Direct support maintenance.

Malfunction	Probable cause
8. Evaporator and condenser fan fails to operate.	<p>a. Defective fan motor.</p> <p>b. Fan blades binding or defective.</p> <p>c. Faulty fan motor thermal protector.</p> <p>d. Defective fan motor receptacle connector.</p>
9. Insufficient cooling.	<p>a. Selector switch improperly set or damaged.</p> <p>b. Fan speed switch improperly set.</p> <p>c. Thermostat (temperature control) set incorrectly or defective.</p> <p>d. Evaporator fan air inlet ring cracked, broken or warped.</p> <p>e. Discharge air grille damaged so the louvers will not open.</p> <p>f. Intake air grille damaged so the louvers will not open.</p> <p>g. Evaporator return air filter clogged to the extent that air will not flow freely.</p> <p>h. Fan motor worn or defective.</p> <p>i. Fans loose or damaged.</p> <p>j. Fan motor thermal protector defective.</p> <p>k. Fresh air damper control chain broken.</p> <p>l. Damaged evaporator fan.</p> <p>m. Damaged condenser fan.</p> <p>n. Air intake or output blocked.</p> <p>o. Unit will not operate in cooling mode.</p> <p>p. Compressor malfunctioning.</p> <p>q. Inadequate suction pressure. Ice on evaporator.</p> <p>r. Faulty expansion valve.</p> <p>s. Moisture in system.</p> <p>t. Excessive discharge pressure, and all other items operating satisfactorily.</p> <p>u. Low suction pressure.</p> <p>v. High suction pressure.</p>

d

a

b. See 1a.

c. Replace (7-11)

d. Replace (para)

e. Replace

f. Replace grille (para 3-18).

g. Clean filter. Replace defective filter (para 3-19).

h. Check voltage at motor terminals. Replace defective motor (para 3-44).

i. Tighten or replace fans (para 3-21 and 3-22).

j. Replace fan motor thermal protector (para 7-10).

k. Replace chain (para 3-23).

l. Replace fan (para 3-21).

m. Replace fan (para 3-22).

n. Remove obstruction.

o. Solenoid valves or thermostat defective. In cool mode, outlet of liquid line solenoid valve (item 8, fig. 1-5) is same temperature as inlet. In bypass mode, this valve is closed. Replace defective valve.

p. Check system pressures. If all components operate satisfactorily, and pressures are not normal, replace complete compressor assembly.

q. Clean filters. Report to D/S.

r. Refer to D/S.

s. Refer to D/S.

t. Refer to D/S.

u. Defective evaporator expansion valve. Refer to D/S.

v. Defective pressure equalizer valve. Discharge line from valve is hot, indicating leak in valve. Replace valve if electrical checks prove valve operative. (Valve clicks when energized.) Refer to D/S.

Malfunction	Probable cause	Corrective action
10. Air output volume insufficient.	w. Excessive discharge pressure (non-operation of high fan speed).	w. Fan speed pressure switch will not operate when condensing pressure exceeds setting of switch. Refer to D/S.
	x. Defective liquid line valve (item 14, fig. 1-5).	x. Valve is open in cooling cycle of operation. Inlet and outlet valve should be same temperature. If not, and valve is satisfactory electrically (valve clicks when energized). Refer to D/S.
	y. Fan motor burnout, bearing failure, excessive noise from motor.	y. Replace motor.
	z. Insufficient amount of refrigerant in system. Check sight glass during cool cycle only.	z. Refer to D/S.
	a. Fan speed switch set incorrectly.	a. Reset switch. Replace defective switch (para 7-11).
	b. Intake air grille not set correctly or damaged to the extent that louvers will not open.	b. Reset grille. Replace defective grille (para 3-20).
	c. Evaporator air filter clogged or damaged to the extent that it will not allow the air to flow freely.	c. Clean evaporator air filter. Replace filter (para 3-19).
	d. Damaged evaporator fan.	d. Replace fan (para 3-21).
	e. Damaged condenser fan.	e. Replace fan (para 3-22).
	f. Fan motor worn or defective.	f. Replace motor (para 3-44).
11. Air conditioner fails to heat.	a. Selector switch improperly adjusted or defective.	a. Reset selector switch to LO-HEAT or HI-HEAT. Replace defective selector switch (para 7-11).
	b. Fan speed switch improperly set or defective.	b. Set fan speed switch on HIGH. Replace defective fan speed switch (para 7-11).
	c. Defective heater.	c. Replace heater (para 3-47).
	d. Protector (heater) temperature control defective.	d. Replace protector (para 3-47).
	e. Thermostat (temperature control) set incorrectly or defective.	e. Reset thermostat. Replace defective thermostat (para 7-11).
	f. Loose heater connections or defective relay.	f. Tighten loose connections. Replace defective relay (para 7-12).
	g. Defective fan motor.	g. Replace motor (para 3-44).
	a. Evaporator fan vibrates.	a. Tighten setscrews on fan motor shaft. Replace damaged fan (para 3-21).
	b. Condenser fan vibrates.	b. Tighten setscrews on fan motor shaft. Replace damaged fan (para 3-22).
	c. Fan motor worn or defective.	c. Replace fan motor (para 3-44).
12. Air conditioner noisy during operation.	a. Rotary selector switch improperly adjusted or defective.	a. Set switch to COOL or VENTILATE. Replace defective switch (para 7-11).
	b. Rectifier terminal loose, or broken insulation.	b. Replace rectifier (para 7-12).
	c. Thermostat defective.	c. Replace thermostat (para 7-11).
	d. Defective fan motor thermal protector or control circuitry.	d. Replace fan motor thermal protector; repair control circuitry (para 7-10).
13. Air conditioner fails to operate.		

Section VI. FIELD EXPEDIENT REPAIRS

3-14. General

Operator and organizational maintenance trouble may occur while the air conditioner is operating in the field where supplies and repair parts are not available and normal corrective action cannot be performed. When this condition exists, the following expedient repairs may be used in emergencies, upon the decision of the unit commander. Equipment so repaired must be removed from operation as soon as possible and properly repaired, before being placed in operation again.

3-15. Compressor Inoperative

<i>Trouble</i>	<i>Expedient remedy</i>
Compressor overload protector repeatedly actuates.	Bypass the protector by installing an insulated jumper wire between terminals 3 and 5 on TB2 in the junction box (fig. 1-4).

Note. If compressor does not start when the air conditioner is connected to the power source, the compressor is defective and must be replaced. Report this condition to direct support maintenance.

3-16. Heater Inoperative

<i>Trouble</i>	<i>Expedient remedy</i>
Heater overheat thermostat repeatedly actuated.	Bypass the thermostat by installing insulated jumper wires between terminals 4 and 5 and between terminals 5 and 6 on the overheat thermostat.

Note.
nected
must

Phase sequence relay
operative.
Fuses defective.
Pressure switch defective.

Short out
Short out pressure switches with wire.

Section VII. ORGANIZATIONAL MAINTENANCE PROCEDURES

3-17. General

The air conditioner is constructed with removable aluminum panels. The front access panel provides access to the control panel and junction box. A discharge grille protects the evaporator and directs the discharge of conditioned air. The intake grille protects the air conditioning filter and regulates the amount of air returned to the unit. The condenser coil grille and fan guard protects the condenser coil and fan. A fresh air inlet screen permits the entry of outside air and is controlled by the damper door with the control spring and chain. This screen also provides access to the refrigerant system service valves. An intake cover provides for attachment of a Chemical and Biological Filter Unit. The cover panel covers the top of the unit.

Warning: Disconnect the air conditioner from the power source before performing any maintenance on the components of the unit.

3-18. Cover Panel, Discharge Grille, Intake Grille, and Front Access Panel

a. Removal. Refer to figure 3-1 and remove the cover panel, discharge grille, intake grille, and front access panel.

b. Installation. Install the cover panel, discharge grille, intake grille, and front access panel in reverse order of removal as illustrated in figure 3-1.

3-19. Mist Eliminator and Air Conditioning Filter

a. Removal. Refer to figure 3-1, and remove the mist eliminator and the air conditioning filter. Remove top cover panel (fig. 3-11) to service mist eliminator.

b. Installation. Replace defective filter and mist eliminator. Refer to figure 3-1, and install the air conditioning filter and mist eliminator in reverse order of removal.

3-20. Fresh Air Inlet Screen, Chemical Biological and Radiological Cover, Fan Guard, and Condenser Coil Grille and Screen

a. Removal. Refer to figure 3-3 and remove the fresh air inlet screen, CBR cover, fan guard, and condenser coil grille and screen.

Note. Service compressor precooler by brushing away dirt or dust that may have accumulated.

b. Installation. Install the fresh air inlet screen, CBR cover, fan guard, and condenser coil grille

and screen in reverse order of removal, illustrated in figure 3-3.

3-21. Evaporator Fan and Inlet Ring

a. General. The air conditioner is equipped with an impeller type centrifugal evaporator fan.

b. Removal. Refer to figure 3-5, and remove the inlet ring and evaporator fan.

c. Installation. Install the inlet ring and evaporator fan in reverse order of removal as illustrated on figure 3-5.

3-22. Condenser Fan

a. General. The condenser fan, figure 3-6, is an axial fan with shroud. The axial fan mounted inside the shroud reduces excessive vibration and noise.

b. Removal. Refer to figure 3-6 and remove the condenser fan.

(1) Remove eight screws and remove condenser fan guard.

(2) Remove two mounting screws and install them in jack screw holes. Tighten these

screws evenly against fan to remove fan. Remove fan, key and bushing.

c. Installation. Install the condenser fan in reverse order of removal, as illustrated in figure 3-6.

Note. When installing condenser fan, assemble fan loosely to bushing with mounting screws and place on motor shaft with keyway aligned. Install key into keyway and drive back toward motor so that key raises on taper in motor shaft keyway. Tighten screws.

3-23. Damper Door Control Chain

a. General. The damper door control should give continuous service with little attention. Should the chain break, replacement is simple.

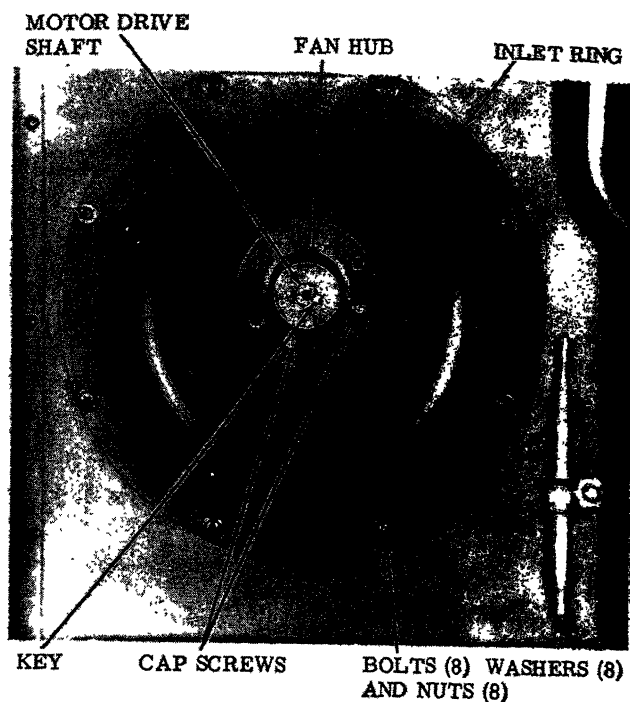
b. Removal.

(1) Remove the air intake grille (paragraph 3-18).

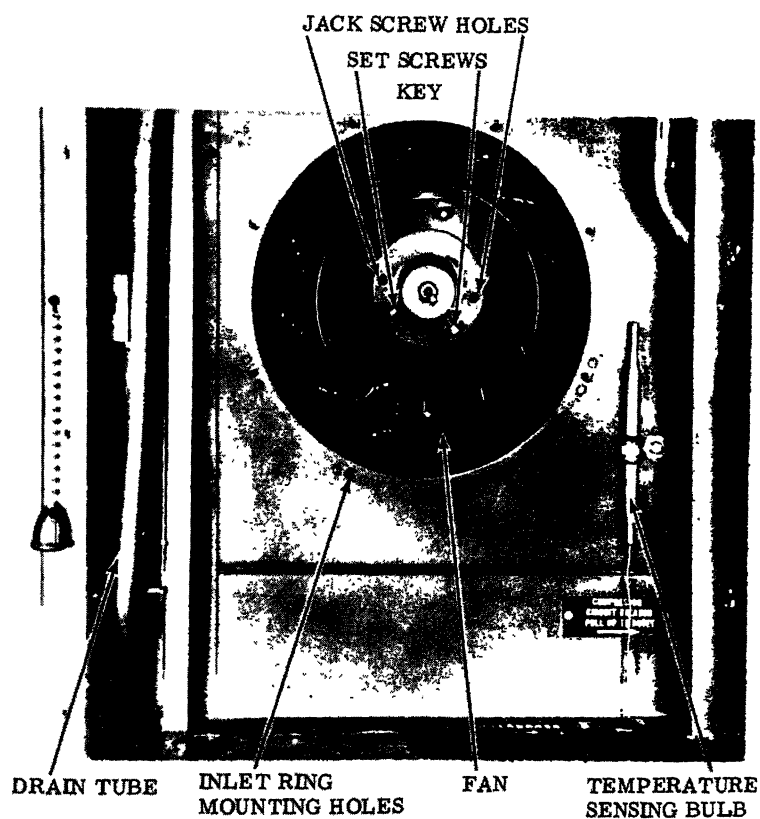
(2) Disconnect chain from clip and remove chain from front of unit.

(3) Remove pendant from chain if required.

c. Installation. Install replacement parts by reversing order of disassembly.



A -INLET RING MOUNTED



B -INLET RING REMOVED

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Figure 3-5. Evaporator fan inlet ring removal and installation.

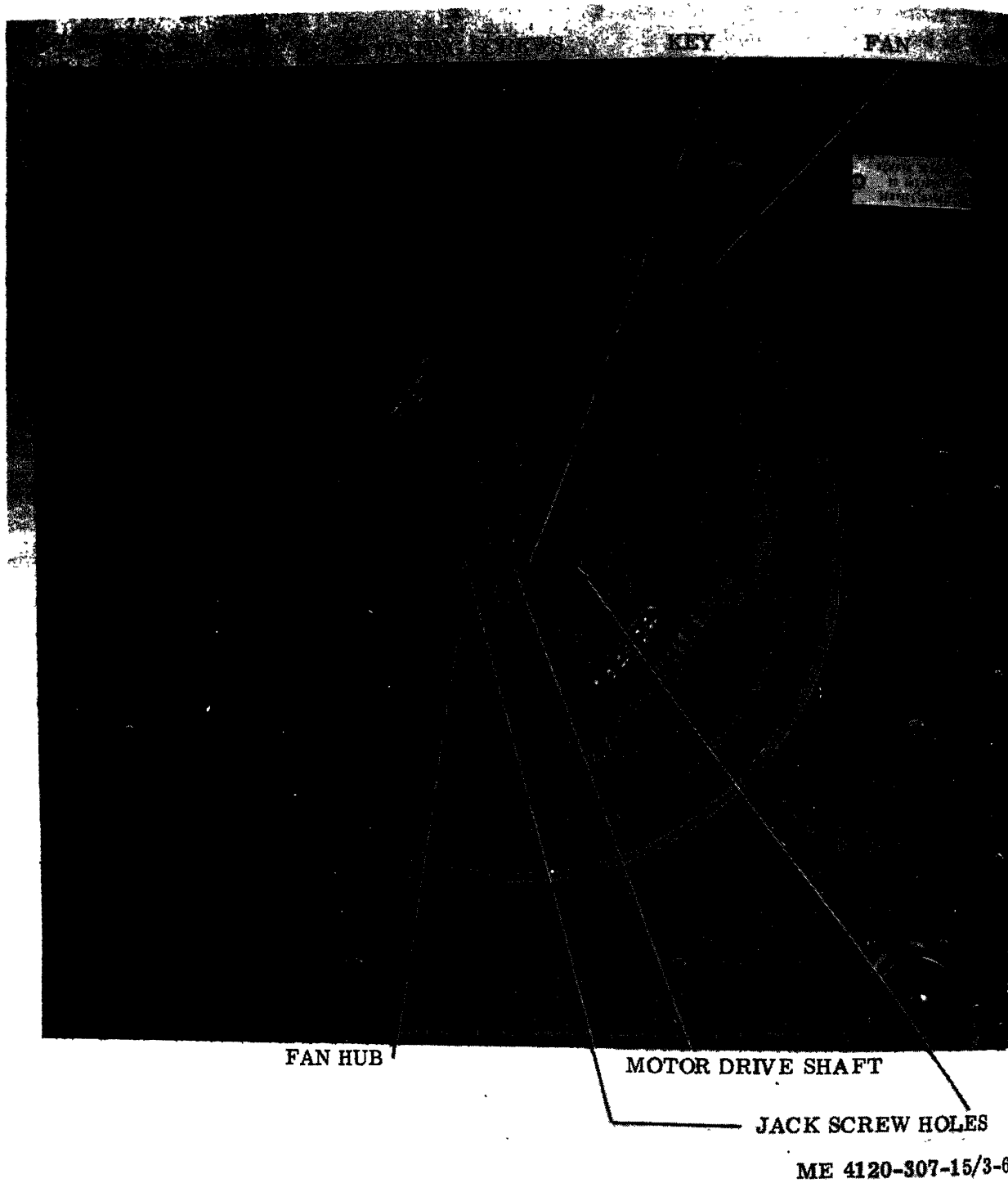


Figure 3-6. Condenser fan removal and installation.

Section VIII. ELECTRICAL SYSTEM AND FAN MOTOR

3-24. General

The electrical system (fig. 1-4) consists of the compressor, fan motor, control panel, junction box and components, heaters and all internal wiring. A compressor thermal overload protector and circuit breaker prevents the compressor from being damaged by electrical overload. Both fans are driven by the two-speed fan motor which has integral overload protection. The heater thermostat prevents overheating when the unit is operating in the heating cycle.

3-25. Electrical Leads

When removing or replacing components of the air conditioner, always inspect condition of all wires and cables. Repair or replace any defective wiring (wiring diagram).

3-26. Description of Electrical Components

a. The unit is equipped with electric heaters, relays to operate the heaters, compressor and fan motor, switches to control current to the electrical components, fuses, a circuit breaker, and a transformer to reduce input voltage to the required control circuit voltage, plus a diode, rectifier and RFI filter.

b. The following paragraphs describe each of the above components, their functions, how they operate and how they should be tested. Any component failing testing should be replaced.

3-27. Heaters

a. *Function.* There are two banks of three heater elements per bank. Their purpose is to provide heated air on demand. They are controlled by a relay and a selector switch. When the selector switch is placed in LO-HEAT position, one bank of the three heater elements is energized; with the selector switch in HI-HEAT position, both banks of the heater elements are energized.

b. *Testing.* Refer to figure 1-4 and, using an ohmmeter, measure resistance between terminals A and B. Meter should read between 20 and 24 ohms. Next, measure resistance between resistor terminals and casing. Must read open circuit ohms.

3-28. Heater Relay (fig. 1-4)

a. *Function.* The heater relay is normally open; and the contacts close when the rotary selector

switch, on the control panel, is set to demand heat. When the relay contacts close, they provide a power circuit to the heater elements, thus producing heat.

b. *Testing.* Disconnect all circuits from relay. Use an ohmmeter and measure the resistance of contacts when relay is not energized. Check A1 to A2, B1 to B2, and C1 to C2. An open circuit must be indicated. Next, apply minimum rated test voltage to relay coil (X1 to X2). Contacts must close, indicated by a "clicking" sound. Finally, measure resistance between contacts A1 to A2, B1 to B2, and C1 to C2. A short circuit must exist.

3-29. Compressor Relay (fig. 1-4)

a. *Function.* A normally open relay that is closed when the rotary selector switch is moved to any position other than OFF. When the relay is closed, it provides power from the power source to the circuit breaker, which, in turn, provides current to the compressor motor.

b. *Testing.* Repeat the test listed in paragraph 3-28.

3-30. Circuit Breaker (fig. 1-4)

a. *Function.* The purpose of the circuit breaker is to protect the compressor motor from an overload of power. It is normally closed to provide current to the compressor motor; but it is designed to open at 28.8 amperes, 208 volts. A manual reset device is provided to close the contacts after fault is corrected. If the circuit breaker trips, and thus opens the contacts, it stops the flow of current to the compressor motor and stops the compressor.

b. *Testing. (with power off.)* Use an ohmmeter and read resistance of the normally closed contacts. Check A1 to A2, B1 to B2, C1 to C2, and C to N/O. A low resistance should be indicated. Now, measure between contact pairs: A1 to B1, B1 to C1, A1 to C1, and between C and each other contact. All should indicate an open circuit. Then, with contacts open, measure between A1 and A2, B1 and B2, C1 and C2, and C and N/O. An open circuit should be indicated.

3-31. Fuses (fig. 1-4)

a. *Function.* There are three fuses in the electrical circuit to prevent an overload to the various electrical circuits. One fuse, with a 5 ampere rating, is located in the direct current circuit; and

two fuses, each with a 1.6 ampere rating, are located in the alternating current circuit.

b. Testing. Remove fuse and, using an ohmmeter, measure resistance between fuse terminals. It should indicate a low value resistance. If the fuse is defective, it will read infinite ohms.

3-32. Rotary Switch (fig. 1-4)

a. Function. This is an eight-pole, four-wafer, five-position rotary selector switch used to direct current to the various electrical devices connected with the heating and cooling modes of operation of the unit. For a description of each position of the switch, refer to table 2-1.

b. Testing. Use an ohmmeter and measure the resistance between associated contacts with the switch set to the respective position. In each position, except OFF, resistance should read zero ohms. The reading should be open circuit with the switch set in the OFF position. The contacts will read open circuit when the switch is in any but the position associated with the contacts being tested.

3-33. Temperature Thermostat Control (fig. 1-4)

a. Function. This is an adjustable, single-pole, double-throw type device that controls direct current to associated elements of the heating and cooling circuits of the unit. It has an adjustable range from +40 to +90 degrees F. (4.4 to 32.22 degrees C.) with a 1.75 degrees F. (0.98 degrees C.) differential at any given setting within the designed range.

b. Testing. With the system connected to its power source, the power on, and the temperature control thermostat set below room temperature, use a voltmeter and check voltage to ground from lug 2. It should read zero volts dc. Now, adjust the thermostat to above room temperature and measure voltage from lug 2 to ground. It should read +28 volts dc.

3-34. Switch Heater Hi-Temperature Cutout (fig. 1-4)

a. Function. A thermostat device with an automatic reset. The contacts open at 194 degrees F. (90 degrees C.) and close at 141.8 degrees F. (61 degrees C.). This switch operates to turn the heaters off if the temperature gets too hot.

b. Testing. Use an ohmmeter and check to assure a low resistance between contacts 4 to 5 to 6 at room temperature. Heat the thermostat to

above 200 degrees F. (93.33 degrees C.), and contacts 4 to 5 to 6 should open.

3-35. Transformer (fig. 1-4)

a. Function. The purpose of the transformer is to step down the 208 volts ac power to 30 volts ac power for the control circuits.

b. Testing. Use an ohmmeter to check for medium resistance at terminals H1 to H2, low resistance at terminals X1 to X2, open circuit between X1 to H1, and open circuit from all terminals to casing. Use a voltmeter to check windings. Apply 208 volts ac, 400 hertz to terminal H1 to H2. It should read 30 volts ac at terminals X1 to X2.

3-36. Rectifier (fig. 1-4)

a. Function. The rectifier is used to rectify the ac current to provide dc power to operate the control circuit.

b. Testing. Use an ohmmeter and measure the forward resistance of rectifier (+) probe to terminal 2 (—) probe to terminal 3. Read low resistance. Remove the probes and read high resistance. Finally, read low resistance between (+) probe 2 and (—) probe 4; (+) 2 and (—) 1; (+) 4 and (—) 3; (+) 1 and (—) 3. Read high resistance between (+) 3 and (—) 1; (+) 3 and (—) 4; (+) 4 and (—) 2; (+) 1 and (—) 2.

3-37. Control Relays (fig. 1-4)

a. Function. These relays are used to control the fan speed as selected by the toggle switch on the control panel. The relays are normally open; and they close on demand of the selector switch, by the application of dc control voltage to the relay coils.

b. Testing. (With relay disconnected.) Use an ohmmeter and measure resistance (should read zero ohms) between associated contacts 2 and 3 (example, A2 to A3). When relay is non-energized, 2 and 1 must be open. Then apply minimum rated test voltage to relay coil. Contacts must close as noted by clicking noise. Finally, measure contact resistance of infinite ohms between associated contacts 2 and 3, and zero ohms between contacts 1 and 2.

3-38. Time Delay Relay (fig. 1-4)

a. Function. The time delay relay is in the control circuit to prevent starting the fan motor and compressor motor simultaneously. It incorporates a 30-second delay in starting the compressor motor after the fan motor has been started

when the circuit is energized by the rotary selector switch.

b. Testing. (With contacts 5 and 7 disconnected.) Using an ohmmeter, measure resistance of contacts 5 to 7 when relay is non-energized. Reading should indicate an open circuit. Next, apply rated voltage to relay coil terminals 2 and 3, and read an open circuit at terminals 5 to 7. After rated time delay of 30 seconds, read zero ohms at terminals 5 to 7.

3-39. Diode (fig. 1-4)

a. Function. The diode is incorporated into the circuit to act as arc suppressor when S3 and S8 are energized.

b. Testing. Use an ohmmeter and measure resistance of (+) probe to anode (—) probe to cathode. Should read low resistance. Reverse probes and should read high resistance.

3-40. RFI Filter (fig. 1-4)

a. Function. This is a device that is incorporated into the electrical circuit of the unit to filter out electrical characteristics that cause interference with radio reception.

b. Testing. Use an ohmmeter and measure resistance between input and output terminals on each filter network. Reading should indicate low resistance. Then measure resistance between terminal and casing. Meter should read low and then increase to open circuit.

3-41. Phase Sequence Relay (fig. 1-4)

a. Function. The purpose of this relay is to provide protection to the compressor motor. It is located in the input power line. If the power lines connected to the unit are of improper polarity, the relay will remain open, preventing the control circuit from functioning. With the control circuit deenergized, power cannot reach the compressor motor. The wrong phase sequence of input can damage the compressor.

b. Testing. Use an ohmmeter and check resistance between terminals 2 and 3. With no voltage applied to contacts A, B, C, you should read an open circuit. Now, disconnect terminal A from terminal 3; and connect 208 volts, three phase, 400 hertz current to the relay, phase A to A, phase B to B, and phase C to C. Resistance between 3 and 2 should be zero ohms. Next, reverse two wires, AB-BC, or CA; resistance between 3 and 2 should read open circuit.

3-42. Toggle Switch (fig. 1-4)

a. Function. The toggle switch, which is mounted on the control panel, is provided to enable the operator to select whether he wishes the fan to run at high speed or low speed. It is operative in one or the other positions anytime the fan motor is operating.

b. Testing. Place switch in the OFF position. Using an ohmmeter you should read high resistance between contacts 1 and 2. Place switch in ON position and you should read zero ohms between contacts 1 and 2.

3-43. Fan Motor (On Equipment Testing)

Test the fan motor for resistance with a multimeter set on the low ohm scale. Touch the leads of the multimeter to the pins in the receptacle connector. The multimeter should indicate an approximate value of 2 ohms across each winding-pin: A-G, D-G, B-H, E-H, C-J, and F-J. The reading should be approximately zero ohms across the thermal protector-pins: A-B, A-C and B-C. Connect one lead of multimeter to the motor frame and touch the other lead to any of the nine pins. Continuity should not exist.

3-44. Fan Motor Assembly, Removal and Installation

a. Removal, (fig. 3-7 and 3-8).

(1) Remove eight screws (1) and remove condenser fan guard (2).

(2) Remove two screws (3) from condenser fan bushing (4a) and install into threaded jack holes provided in bushing. Tighten screws evenly against fan to remove fan from bushing. Remove bushing, condenser fan (4) and key (5).

(3) Remove 4 screws (6), washers (7), 4 washers (9) and remove baffle (8) and spacers (10).

(4) Remove intake air grille and return air filter, then remove 8 screws from fan inlet ring and remove ring.

(5) Loosen 2 setscrews (15) and remove the evaporator fan (16) and key (17).

(6) Disconnect the fan motor electrical connector (20) from the motor (30).

(7) Remove 4 screws (18), nuts (21), washers (22) and grommets (23) from the motor and flange.

(8) Remove 2 screws (24) washers (25, 26), grommets (27) and washers (28, 29) from the base of the motor. Remove the motor (30) from the air conditioner cabinet.

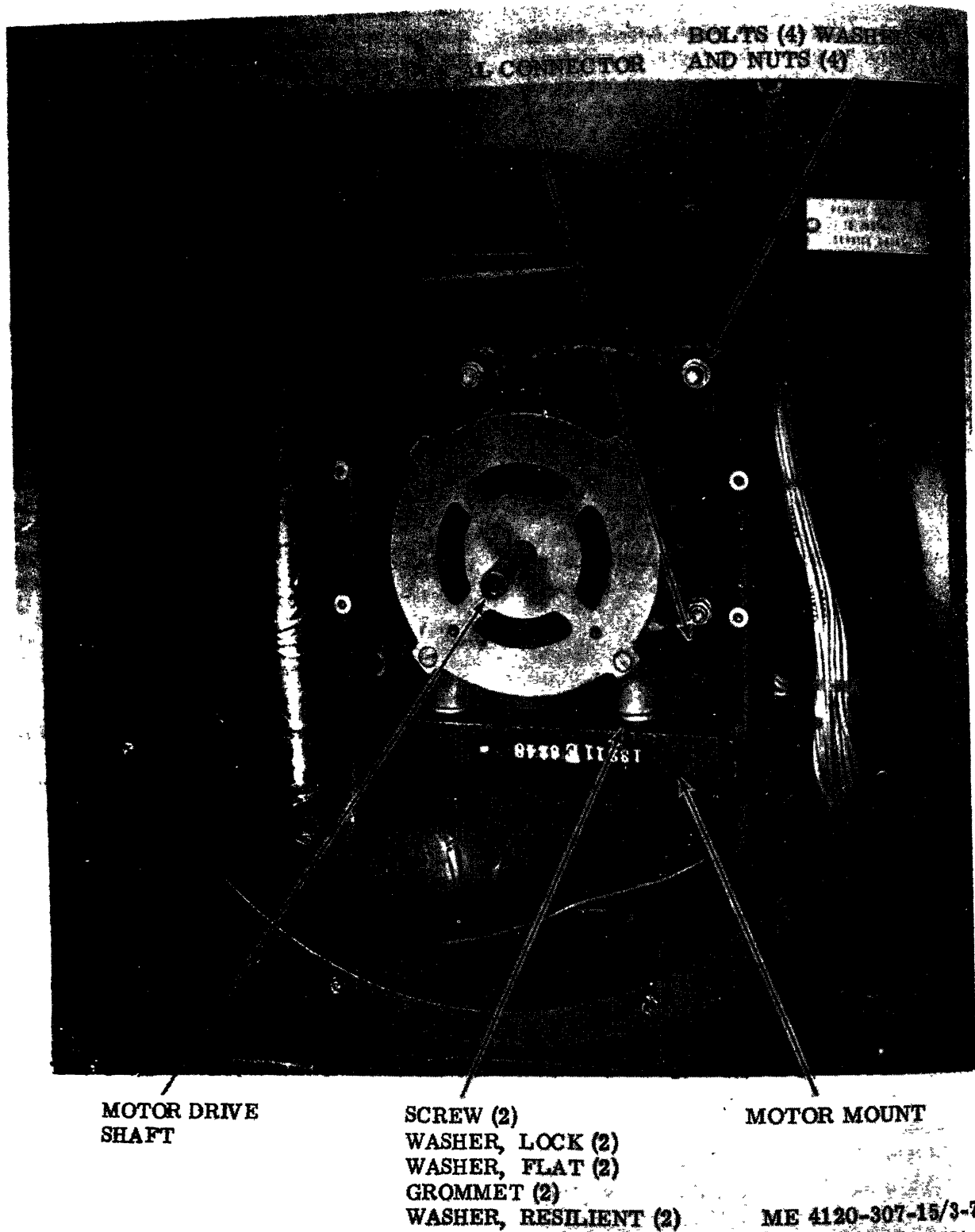
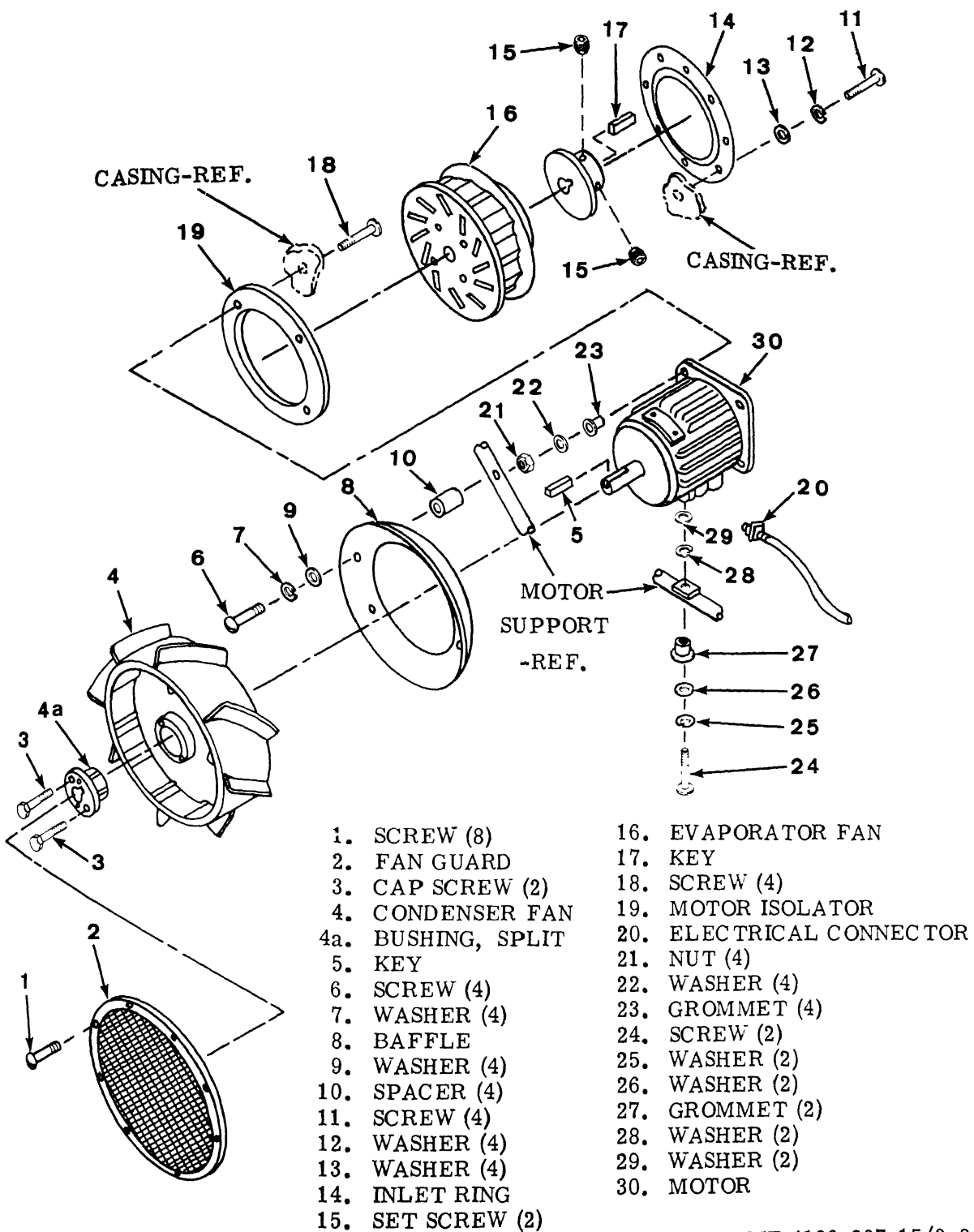


Figure 3-7. Fan motor removal and installation.



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Figure 3-8. Fan assembly, removal and installation.

b. *Installation, (fig. 3-8).* Installation should be performed in reverse order of removal. Be sure key is installed with evaporator fan and that the setscrews are tight. Torque screws to 82 pounds inch.

Note. When installing condenser fan, assemble fan (4) loosely to bushing (4a) with screws (3) and place on motor shaft, with keyway aligned. Install key (5) into keyway and drive back toward motor so that key raises on taper in motor shaft keyway. Tighten screws (3).

3-45. Control Panel Assembly, Removal and Installation

a. Removal, (fig. 3-9).

(1) Remove 2 screws in lower front panel and remove the panel.

(2) Disconnect the electrical connector from the control panel.

(3) Remove the air filter and remove the thermostat remote bulb from its retaining clamp. Push the bulb through the grommet at the bottom of the air intake opening.

(4) Remove the junction box front panel by removing 4 screws and sealing gasket.

(5) Remove 4 screws securing the control panel assembly to the junction box assembly and remove the control panel.

b. *Installation, (fig. 3-9).* Installation should be performed in reverse order of removal. If junction box front panel gasket was damaged during removal, install a new one.

3-46. Junction Box Assembly, Removal and Installation

a. Removal, (fig. 3-10).

(1) Remove 2 screws in lower front panel and remove the panel.

(2) Remove the control panel assembly as outlined in paragraph 3-45.

(3) Disconnect the 2 electrical connectors from the junction box assembly.

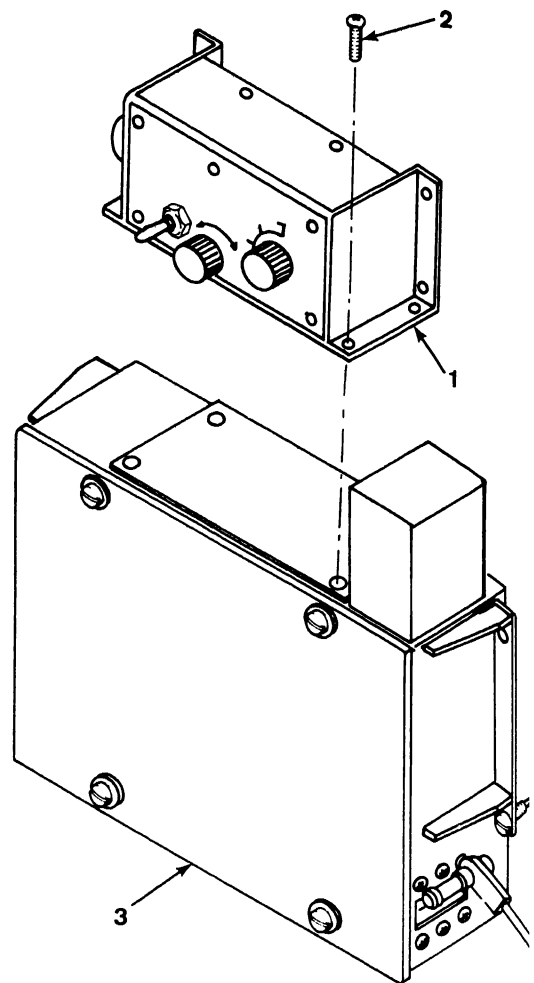
(4) Unscrew the white knob from the circuit breaker reset linkage (fig. 2-2). Pull the pin (8) from the circuit breaker at the bottom of the linkage (7).

(5) Remove 4 screws (2), 4 flat washers (3) and 4 retaining washers securing the junction box and remove the assembly from the air conditioner.

b. *Installation, (fig. 3-10).* Installation should be performed in reverse order of removal.

3-47. Heaters and Protection Thermostat, Removal and Installation

a. *General.* There are six electric heater elements mounted at the rear of the evaporator coil.



1. CONTROL PANEL ASSEMBLY
2. SCREW (4)
3. JUNCTION BOX ASSEMBLY

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Figure 3-9. Control panel assembly, removal and installation

Procedures are given for only one heater as all are removed and installed in the same manner. Only one protector thermostat is used for all heaters.

b. Removal, (fig. 3-11).

(1) Remove 20 screws (1) securing the top panel (2) on the air conditioner and remove the top panel.

(2) Remove nuts (3) and washers (4), securing wiring (5) to heater (9) and remove the wiring. Be sure to tag all wires for identification later.

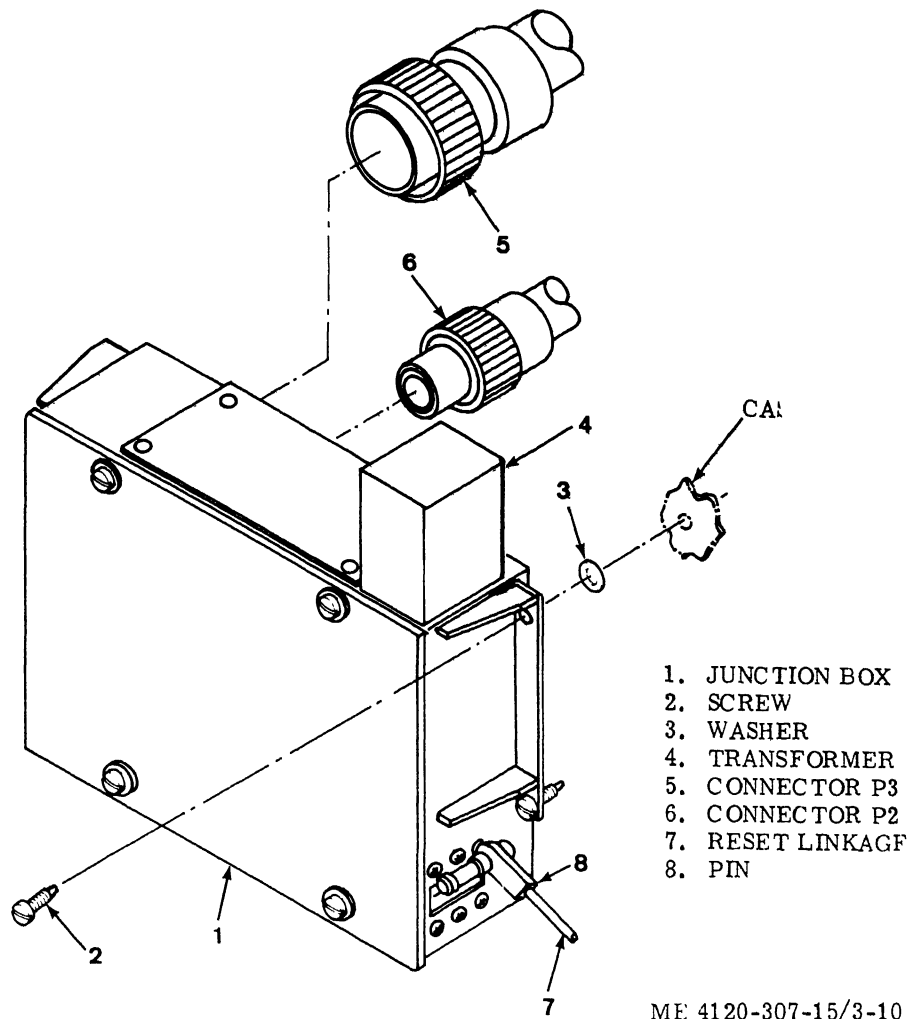


Figure 3-10. Junction box assembly removal and installation.

(3) Remove screw (6), washer (7), and bracket (8), securing heater (9) to cabinet and lift the heater from the air conditioner.

(4) To remove the heater protector thermostat (13), perform steps (5) and (6) below.

(5) Disconnect the 3 wires connected to the protector thermostat and tag the wires for later identification.

(6) Remove 2 screws (10), nuts (12), and washers (11) holding the protector to the air conditioner cabinet and remove the protector.

c. *Installation, (fig. 3-11).* Installation should be performed in reverse order of removal. Be sure that all wiring is reconnected properly and that all connections are tight. Keep wiring terminals oriented so that shorts do not occur across the heater terminals.

3-48. Three Phase Power Input Wiring Harness, Removal and Installation

a. *Removal, (fig. 3-12).*

(1) Remove 4 screws securing connector J1 to the case assembly.

(2) Disconnect P2 from connector J2.

(3) Remove screw, nut, washer, and clamp, securing the harness to the casing assembly, and carefully remove the harness.

b. *Installation, (fig. 3-12).* Installation of the three phase power input wiring harness shall be in reverse order of removal. Care should be taken while installing the harness so that the cable is not crimped or damaged from sharp bends or under stress.

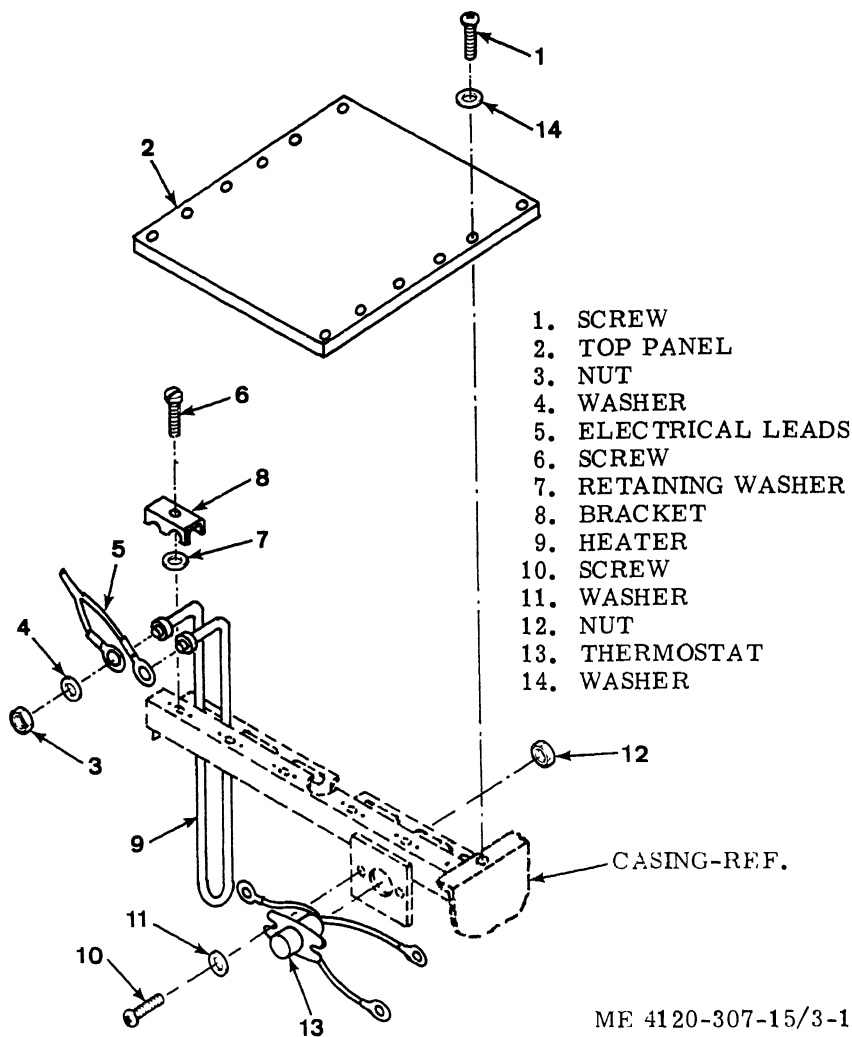


Figure 3-11. Heaters and protection thermostat, removal and installation.

3-49. Three Phase Heater Wiring Harness, Removal and Installation

a. Removal, (fig. 3-13).

(1) Remove connector P8 from J8, then remove 4 screws, securing connector J8 to the case, and remove the connector.

(2) Disconnect the wire leads from each heater (total fifteen wire leads).

(3) Remove screw, nut, and washer from each clamp holding the harness to the case assembly.

(4) Remove the harness assembly from the air conditioner.

b. Installation. (fig. 3-13). Installation of the three phase heater wiring harness shall be in reverse order of removal. Care should be taken while installing the harness so the cable is not

crimped or damaged from sharp bends or undue stress.

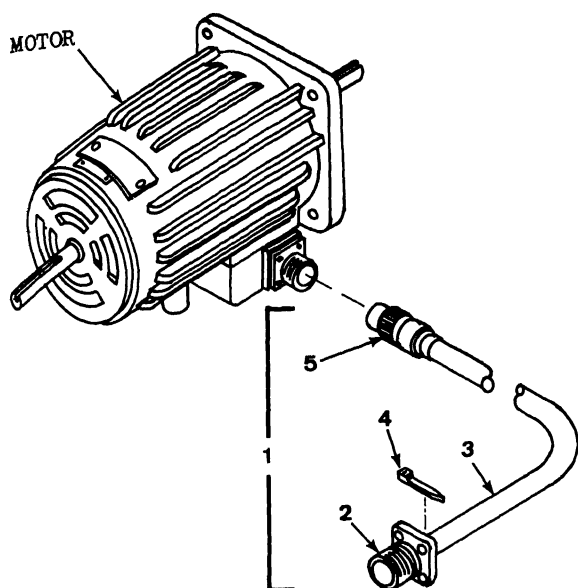
3-50. Three Phase Wiring Harness, Removal and Installation

a. Removal, (fig. 3-14).

(1) Disconnect connectors P3 from J3 on the junction box, P4 from J4 on the compressor, from J5 on the bypass solenoid valve, P6 from the pressure equalizer solenoid valve, P7 from J7 on the control panel, P8 from J8 for the heater wiring harness and P9 from J9 on the motor.

(2) Remove nut and washer from each end of the harness that is connected to pressure switches S6 and S7.

(3) Remove nut, washer and screw holding the ground lug and removing the lug.



1. WIRING HARNESS, POWER INPUT
2. CONNECTOR, RECEPTACLE
3. WIRE, ELECTRIC
4. STRAP, CABLE ADJUSTABLE
5. CONNECTOR, PLUG, ELECTRIC, STRAIGHT

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Figure 3-12. Three phase power input wiring harness, removal and installation.

(4) Unsolder leads from S3 to P3 at connector P3.

(5) Remove screw, nut and washer from each clamp securing the wiring harness and remove the clamps.

(6) Carefully remove the wiring harness from the case assembly.

b. Installation, (fig. 3-14). Installation of the three phase wiring harness shall be in reverse

order of removal. Care should be taken while installing the harness so that the cable is not crimped or damaged from sharp bends or under stress.

3-51. Wiring Harness Repair

a. General. Three wiring harnesses are used in the air conditioner and may be removed as described in paragraph 3-49 and paragraph 3-50. If a harness is severely damaged, it should be replaced. The procedures contained here provide for repair to minor damage.

b. Disassembly, (fig. 3-15).

(1) Disassemble the connector as shown in figure 7-12 to gain access to the wiring soldered to the connector pins.

(2) To remove a wire, unsolder it from the pins on each connector and pull the wire from the harness assembly.

(3) To remove a connector, unsolder all wires, one at a time, from the connector to be removed. Tag each wire as it is unsoldered.

c. Cleaning, Inspection, Replacement.

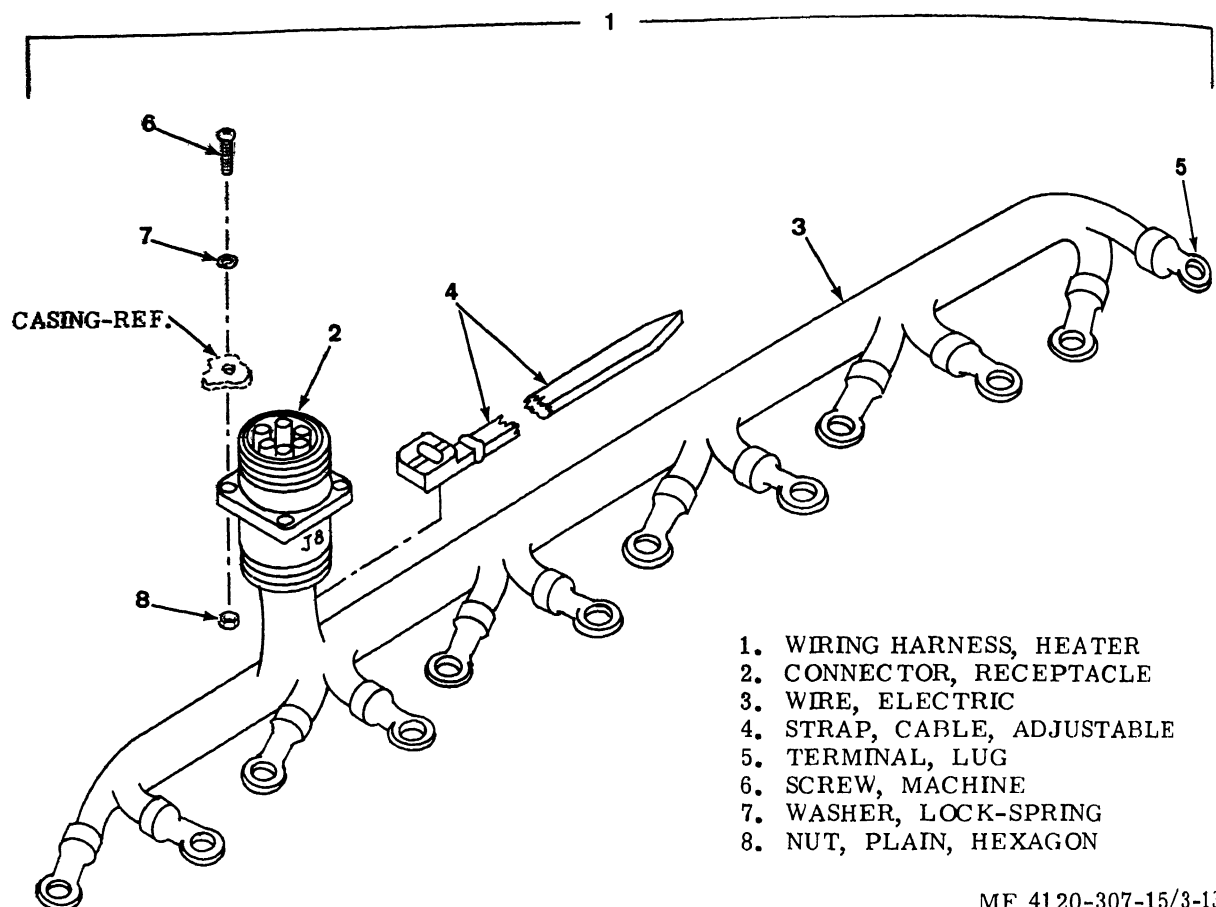
(1) Inspect the connectors for cracked or damaged shells and for bent pins.

(2) Inspect the harness wiring for broken wires and frayed or damaged insulation.

(3) Use an ohmmeter and check continuity of each wire from the pin of one connector to the corresponding pin of the other connector, (wiring diagram fig. 1-4). Ohmmeter should read approximately zero ohms.

(4) Check continuity between each pin and all other pins on all connectors. Infinite ohms should exist between all pins, unless connected as shown on wiring diagram.

d. Reassembly. Reassemble the connector shells in reverse order of disassembly. Be sure the shell insulator is in place and not damaged.



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Figure 3-13. Three phase heater wiring harness, removal and installation.

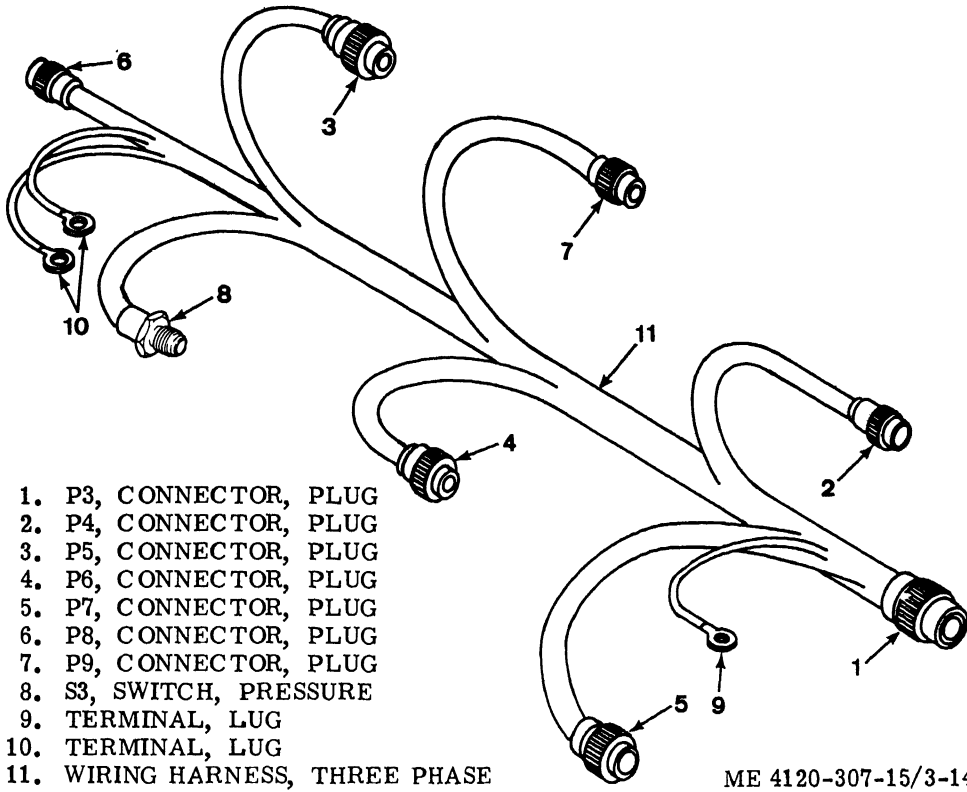
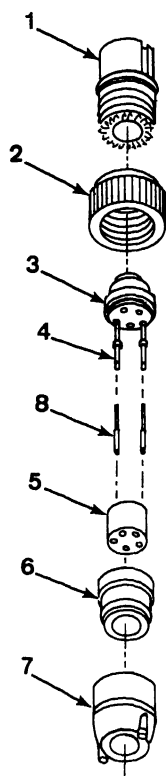


Figure 3-14. Three phase wiring harness, removal and installation.



1. BARREL
2. NUT, COUPLING
3. INSULATOR
4. CONTACTS, PIN
5. GROMMET
6. FERRULE
7. ENDBELL
8. WIRE

ME 4120-307-15/3-15

Figure 3-15. Wiring harness and connector repair.

Section IX. HOSE CLAMPS, HOSES, TUBE RETAINING STRAPS, PIPE PLUGS, RECEPTACLE HOLE COVERS, TUBE CLIPS AND CONDENSATE DRAINS

3-52. General

When refrigerant system is opened for maintenance, all hoses and tubes disconnected should be removed, cleaned, inspected, and reinstalled securely.

3-53. Hose Clamps, Hoses, Tube Retaining Straps, Pipe Plugs, Receptacle Hole Covers and Tube Clips

a. Removal.

- (1) Remove the front access panel (para 3-18).
- (2) Remove the air conditioning filter (para 3-19).

(3) Remove the hose clamps, hoses, tube retaining straps, pipe plugs, receptacle hole covers and tube clips by removing standard hardware as required.

b. Cleaning and Inspection.

(1) Clean all parts with dry cleaning solvent, Federal Specification P-S-661, and dry thoroughly.

(2) Inspect hoses for signs of wear. Inspect all parts for cracks, breaks or other defects. Inspect threaded parts for worn or damaged threads.

(3) Replace damaged or defective parts.

c. Installation. Install all internal parts by reversing order of removal.

d. Install Panel. See paragraph 3-18b.

3-54. Condensate Drains (fig. 3-16)

a. Removal.

- (1) Remove two screws, securing the front access panel, and remove the panel.
- (2) Remove the upper hose clamp and remove the drain tube with the ball check assembly.
- (3) Remove cotter pin from ball check assembly; then remove spring and ball.

b. Cleaning and Inspection.

(1) Clean the ball and spring in dry cleaning solvent, Federal Specification P-S-661, and dry thoroughly.

(2) Clean the drain tube, being sure that all foreign matter is removed. Use compressed air to blow out the drain.

(3) Inspect the ball and ball seat for pitting or scratches that would affect sealing.

(4) Inspect the spring for proper tension. Replace any defective parts.

(5) Reassemble the parts in the reverse order of disassembly.

c. Installation.

(1) Install the condensate drain tube with ball check assembly in reverse orders of removal.

(2) Install the front panel on the front of the unit with two screws.

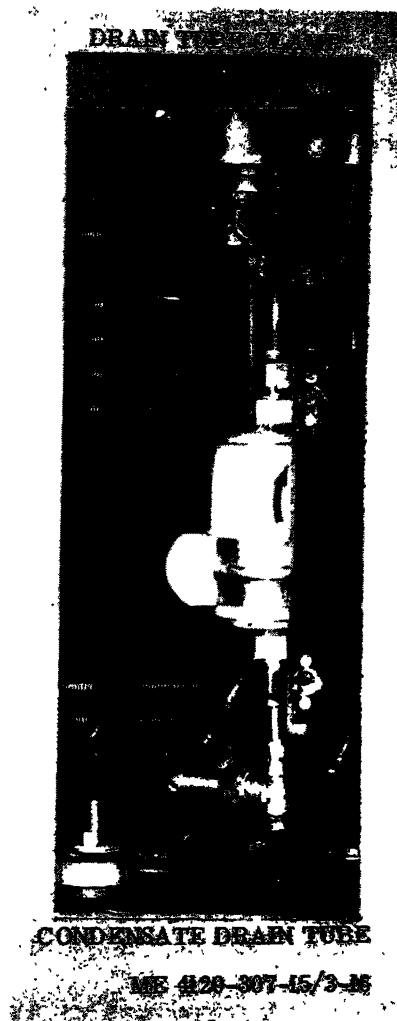


Figure 3-16. Condensate drain, removal and installation.

CHAPTER 4

MATERIAL USED IN CONJUNCTION WITH MAJOR ITEM

A sound attenuator is recommended for use on this air conditioner. Sufficient clearance must be allowed when the sound attenuator is utilized. The attenuator provides a sound dampening effect for the normal sounds the air conditioner emits. It is mounted on the front of the air conditioner,

and may be used in cases where the system does not have air ducts attached. The attenuator replaces the air intake and discharge grilles. The return air enters the bottom, and the conditioned air leaves the top of the attenuator. Refer to figure 1-2 for proper attenuator installation.

CHAPTER 5

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

5-1. General

This section provides information on preparing the air conditioner for shipment from an operating or stored condition and preparing it for limited storage.

5-2. Preparation for Shipment

a. General. If the air conditioner is being operated or is in other than a stored condition, perform the procedures which prepare it for limited storage in paragraphs 5-4 and 5-5.

b. Preservation. The unit must be preserved in accordance with Military Specification MIL-P-116.

c. Packing. Wrap the air conditioner in two layers of barrier paper and pack in a wooden crate. Be sure to bolt the air conditioner to the base of the crate.

d. Sealing. Seal all openings with pressure sensitive tape.

e. Securing. Secure the lid to the crate with wood screws. Strapping shall be zinc coated and placed adjacent to the skids.

5-3. Loading Equipment for Shipment

a. Use a forklift or a crane of sufficient capacity to lift the unit to the bed of the carrier.

Caution: If a hoisting device is used, the unit must be held by guy ropes to prevent swinging that might damage the air conditioner.

b. Secure the air conditioner to the carrier by blocking, tying or other suitable means that will prevent the unit from moving or upsetting during transit.

5-4. Preparation for Limited Storage

a. Inspection. Make a complete inspection of the air conditioner to determine its condition. Deficiencies will be corrected before placing the unit in limited storage. Technical inspections will be performed on unboxed items.

b. Preservation. Use a cloth dampened with dry cleaning solvent, Federal Specification P-S-661. Coat machine surfaces with preservative or cover with barrier material. Coat exposed metal surfaces with preservative. Store all air conditioning units in a room where a low relative humidity and an even temperature is maintained, if possible. Where no suitable storage facility is available, cover the entire unit with a tarpaulin.

5-5. Inspection During Limited Storage

a. All equipment in limited storage will be inspected every 30 days for any unusual conditions such as damage, rusting, moisture, and pilferage.

b. DA Form 2404 will be executed on each major unit of equipment.

Section II. DEMOLITION OF MATERIAL TO PREVENT ENEMY USE

5-6. General

When capture, or abandonment of the air conditioner to an enemy, is imminent, the responsible unit commander must make the decision either to destroy the equipment or to render it inoperative. Based on this decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all air conditioners and all corresponding repair parts.

5-7. Demolition to Render the Air Conditioner Inoperative

a. Demolition by Mechanical Means. Use sledge hammers, crowbars, picks, axes, or any other heavy tool which may be available to destroy the following:

- (1) Evaporator coil.
- (2) Condenser coil.
- (3) Compressor.
- (4) Thermostatic expansion valves.

- (5) Fan motor.
- (6) Control box.

Note. The above steps are minimum requirements for this method.

b. Misuse. Perform the following steps to render the air conditioner inoperative:

- (1) Pinch refrigerant tubing completely shut.
- (2) Bend evaporator fan blades so they will strike casing.

(3) Open suction line access valve. Open tubing and pour sand or other abrasive into refrigerant piping. Start and operate the air conditioner until the compressor fails.

Note. The above steps are minimum requirements for this method.

5-8. Demolition by Explosives or Weapons Fire

a. Explosives. Place as many of the following charges (fig. 5-1) as the situation permits and detonate them simultaneously with detonating cord and a suitable detonator.

- (1) Two 1/2-pound charges between the compressor and control box.
- (2) One 1/2-pound charge on the condenser coil.
- (3) One 1/2-pound charge on the evaporator coil.

Note. The above charges are the minimum requirements for this method.

b. Weapons Fire. Fire on the air conditioner with the heaviest practical weapons available.

5-9. Other Demolition Methods

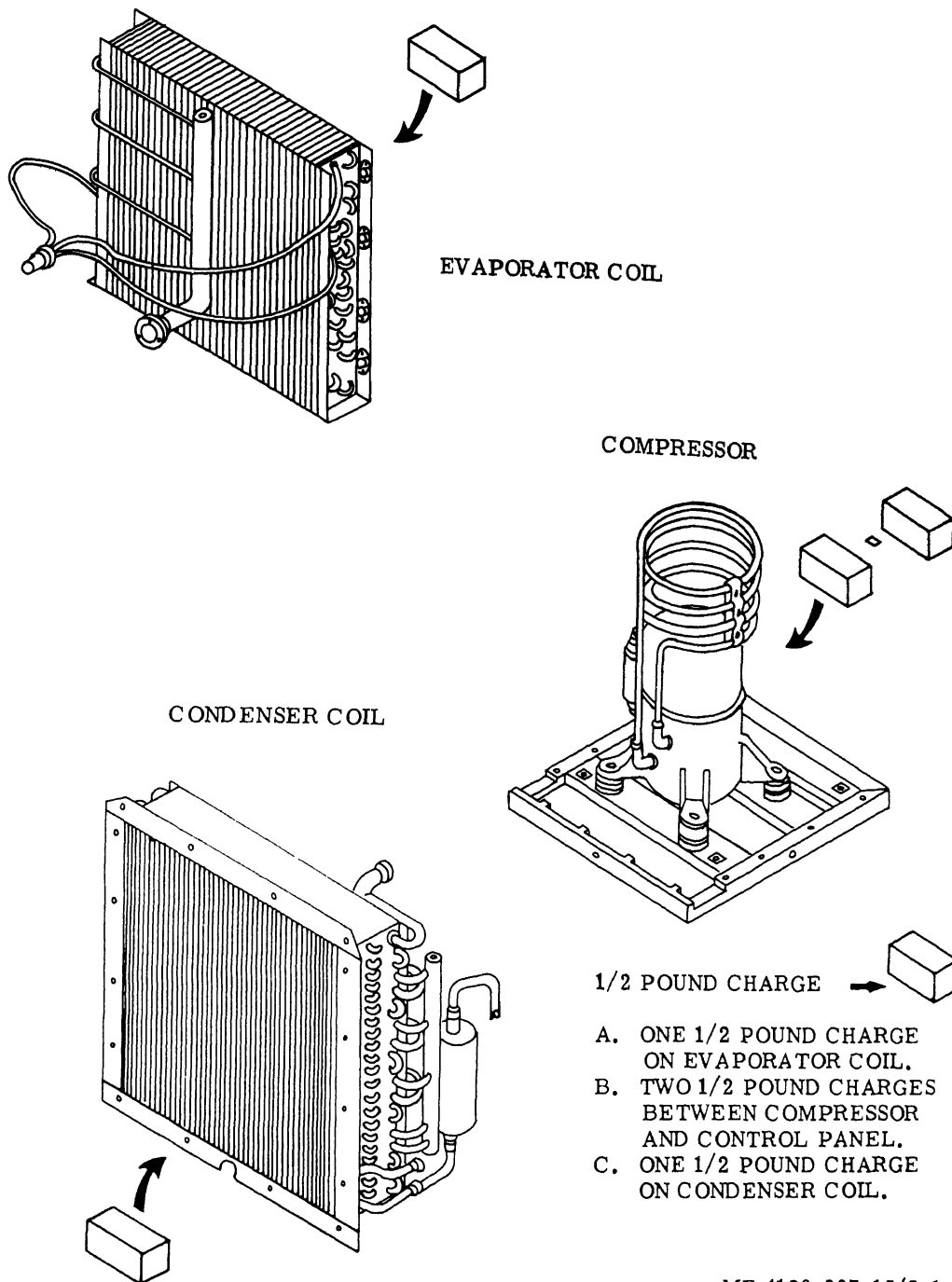
a. Scattering and Concealment. Remove all easily accessible parts, such as the condenser and evaporator fans, fan motor, and control box. Scatter them through dense foliage; bury them in dirt or sand; or throw them in a lake, stream, or other body of water.

b. Burning. Pack rags, clothing, or canvas under, around, and inside the air conditioner. Saturate this packing with gasoline, oil, or diesel fuel and ignite.

c. Submersion. Totally submerge the air conditioner in a body of water to provide water damage and concealment. Salt water will damage metal parts more than fresh water.

5-10. Training

All operators should receive thorough training in the destruction of the air conditioner. Refer to FM 5-25. Simulated destruction, using all of the methods listed above, should be included in the operator training program. It must be emphasized in training that demolition operations are usually necessitated by critical situations when time available for carrying out destruction is limited. For this reason, it is necessary that operators be thoroughly familiar with all methods of destruction of equipment; and they should be able to conduct demolition without reference to this or any other manual.



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Figure 5-1. Placement of demolition charges.

CHAPTER 6

DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

6-1. Scope

a. These instructions are published for the use of direct and general support and depot maintenance personnel maintaining the Model F18T4-2 air conditioner. They provide information on the maintenance of the equipment, which is beyond the scope of the tools, equipment, personnel or supplies normally available to using organizations.

b. Report all equipment improvement recommendations as prescribed by TM 38-750.

6-2. Forms and Records

a. DA Form 2258 (Depreservation Guide for Vehicles and Equipment).

b. DA Form 2028 shall be used for reporting discrepancies and recommendations for improving this equipment publication. The form shall be completed by the individual using the manual and forwarded direct to Commanding General, U.S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Blvd., St. Louis, Mo. 63120.

c. For other record and report forms applicable to direct and general support and depot maintenance, refer to TM 38-750.

Note. Applicable forms, excluding standard form 46 carried by the operator, shall be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND DATA

6-3. Description

For a complete description of the F18T4-2 air conditioner, refer to paragraph 1-3.

6-4. Tabulated Data

This paragraph contains all the repair data pertinent to direct and general support and depot maintenance personnel. A wiring diagram (fig. 1-4) and refrigeration diagram (fig. 1-5) are also included. For additional tabulated data, refer to paragraph 1-4b.

a. Compressor.

Manufacturer ----- Whirlpool
Model ----- WHP-422H-18-208-3
Part No. ----- 474843
Type ----- Rotary Vane
Horsepower ----- 4
Lubrication ----- Forced Feed
Phase ----- 3
RPM ----- 3660
Hertz ----- 400
Voltage ----- 208
Full load amperage ----- 19.0
Locked rotor amperage ----- 64.0
Weight ----- 46.0 lbs.
Oil type ----- Texaco Capelia "D"

b. Condenser and Evaporator coils.

Manufacturer ----- Bohn Aluminum and Brass Co.
Type ----- Copper tube-aluminum fin type

c. Pressure Relief Valve.

Manufacturer ----- Superior Valve Co.
Part No. ----- 3001X4-540
Setting ----- 540 psi

d. Back Pressure Regulating Valve.

Manufacturer ----- Controls Co. of America
Model ----- 237 AVL
Setting ----- 58 psig

e. Service Valves (suction and discharge).

Manufacturer ----- Robinair Mfg. Corp.
Part No. ----- VUS3-46AC
Rating ----- 600 psi
No. per unit ----- 2

f. Solenoid Valves.

Manufacturer ----- Jackes-Evans Mfg. Co.
Type ----- OB241
No. per unit ----- 2 (1 liquid line and 1 hot gas bypass)
Watts ----- 14 max
Volts ----- 24 dc
Refrigerant ----- R-22

g. Thermostatic Expansion Valve (evaporator).

Manufacturer ----- Alco Valve Co.
Model ----- TCL100HW100-15B
Type ----- Angle
Inlet ----- 3/8 in. nominal
Outlet ----- 5/8 in. nominal
Setting ----- 6°F ± 1.5°F
(14.4°C ± 0.84°C)

A. High Pressure Cutout Control.

Manufacturer ----- Penn Controls, Inc.
Model ----- 210-AP-40-AN
Connection ----- 1/4 in. SAE flare
Cutout point ----- 445 ± 10 psig
Manual reset ----- below 400 psig

i. Low Pressure Cutout Control.

Manufacturer ----- Penn Controls, Inc.
Model ----- 210-AP-10-AN
Connection ----- 1/4 in. SAE flare
Cutout point ----- 7 ± 5 psig
Manual reset ----- above 19 ± psig

j. Dehydrator.

Manufacturer ----- Sporian Valve Co.
Part No. ----- C-083

k. Capacities.

Compressor crankcase ----- 20.5 oz.
Refrigerant charge ----- 8 lbs.

l. Solenoid Valves L1 and L2.

Manufacturer ----- Jackes-Evans
Part No. ----- OB241
Coil voltage ----- 24 volts dc
Coil current, (holding) ----- 0.51 amp
Valve safe working
pressure ----- 425 psig
Valve orifice size ----- 0.25 inch
Valve condition ----- normally open

m. High Pressure Cutout Switch S6.

Manufacturer ----- Penn Controls, Inc.
Part No. ----- 210-AP40-AN
Cutout point ----- 445 ± 10 psig
Manual reset ----- below 400 psig
Contact type ----- single pole, single throw

n. Low Pressure Cutout Switch S7.

Manufacturer ----- Penn Controls, Inc.
Part No. ----- 210-AP10-AN
Cutout point ----- 7 ± 5 psig
Manual reset ----- above 19 ± 5 psig
Contact type ----- single pole, single throw

o. Pressure Switch S3.

Manufacturer ----- Metals and Controls, Inc.
Part No. ----- 6PS306M400M350J
Voltage ----- 24 volts dc
Current ----- 5 amp resistive
Contact type ----- single pole, single throw
Points close on rising
pressure at ----- 405 ± 16 psig
Points open at ----- 350 ± 16 psig

p. Expansion Valve, Evaporator, 1 ton.

Manufacturer ----- Alco Valve Co.
Part No. ----- TCL-100HW100-15B
Capacity ----- 1 ton
Superheat ----- 6 ± 1.5°F (3.89 ± 0.84°C)
for R22
Valve body ----- Brass
Type ----- Angle
Inlet ----- 3/8 in. nominal
Outlet ----- 5/8 in. nominal

q. Expansion Valve Bypass, 1/4 Ton.

Manufacturer ----- Alco Valve Co.
Part No. ----- TCL-75C-15B
Capacity ----- 1/4 Ton
Superheat ----- 25 ± 1.5°F (3.89 ± 0.84°C)
for R 22
Valve body ----- Brass

r. Pressure Relief Valve.

Manufacturer ----- Superior Valve Co.
Part No. ----- 3001X4-540
Discharge pressure ----- 540 ± 54 psig
Capacity (air) ----- 15.9 lbs. per minute
Valve body ----- Brass

s. Pressure Regulating Valve.

Manufacturer ----- Control Co. of America
Model No. ----- 237AVL
Regulating pressure ----- 58 psig
Minimum capacity ----- 2.2 Tons

t. Nut and Bolt Torque Data.

Size nut or bolt	Torque (lb.-ft.)
1/4 -20	7- 9
1/4 -28	8-10
5/16-24	13-17
3/8 -16	30-35

u. Diagrams.

Figure 1-4 shows a wiring diagram of the a conditioner while figure 1-5 illustrates a refrigeration flow diagram.

v. Refrigerant Check Valve.

Manufacturer ----- Superior Valve Co.
Part No. ----- P802A-1-6S

w. Tank.

Manufacturer ----- Kaco Industries, Inc.
Part No. ----- 13215E9834

x. Receiver.

Manufacturer ----- Kaco Industries, Inc.
Part No. ----- 13215E9833

Section III. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

6-5. Special Tools and Equipment

No special tools or equipment are required.

6-6. Direct and General Support and Depot Maintenance Repair Parts

Direct and general support and depot maintenance repair parts are listed and illustrated in TM 5-4120-307-25P (when published).

6-7. Specially Designed Tools and Equipment

No specially designed tools or equipment are required.

Section IV. TROUBLESHOOTING

6-8. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner or any of its components. The information is provided in tabular form and presented in table 6-1. The mal-

function of the system is listed in the first column of the table with the probable causes of that malfunction listed in the second column. The third column of the table gives the corrective action for each probable cause. Refer to table 6-2 for normal operating pressures which can be helpful in troubleshooting.

Table 6-1. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Air conditioner fails to operate.	<p>a. Main power receptacle connector defective.</p> <p>b. Refrigerant charge inadequate.</p> <p>c. Moisture in system.</p> <p>d. Compressor inherent protector (S5) defective or open.</p> <p>e. Pressure switches do not reset.</p>	<p>a. Replace receptacle connector (para 3-50).</p> <p>b. Install pressure gages (para 7-4). Check system. Repair leaks.</p> <p>c. Check sight glass for moisture.</p> <p>d. Insure compressor is operating at normal temperature. If temperature is excessive, allow to cool and test S5. Check system pressures. If switch is open when compressor cools (1 hour), replace compressor.</p> <p>e. Check system pressures. If not normal, correct by repair of leaks, proper amount of refrigerant charge and proper operation of controls. Check compressor. If malfunctions occur with compressor, replace complete compressor motor assembly.</p>
2. Fan motor will not operate on high position.	<p>f. Defective fan motor.</p> <p>g. Faulty compressor motor. Fan speed pressure switch malfunction.</p>	<p>f. Repair defective motor (para 3-44).</p> <p>g. Replace compressor (para 6-13). Check system pressures. Replace switch if not operating in accordance with normal pressures.</p>
3. Compressor fails to start, or operation is noisy or erratic.	<p>a. S5 switch inoperative or defective.</p> <p>b. Compressor burnout.</p> <p>c. Compressor noisy.</p>	<p>a. Allow compressor to cool. Check system pressure/temperature chart. If switch is open when compressor is cool, replace complete compressor.</p> <p>b. Make electrical tests of windings. If excessive resistance is indicated—or opens, shorts, leakage, etc. exist—test for burnout by odor of refrigerant or oil. Replace compressor. (clean-up after burnout, para 7-18).</p> <p>c. Check amperage, voltage, pressure, etc. Insure proper thermostatic expansion valve operation, superheat, no flooding, quench valve normal. Replace compressor. Compressor is designed to operate only one direction, as controlled by phase sequence relay. Do not bypass relay, interchange any external or internal phase lead-in wiring, or start relay wires.</p>

Table 6-1. Troubleshooting—Continued

Malfunction	Probable cause	Corrective action
4. Insufficient cooling.	a. Undercharge of refrigerant. (with unit operating in the cooling cycle) b. Low refrigerant pressure. c. Defective compressor.	a. Check refrigerant level in sight glass. Test for leaks and b. Check pressure regulating valve. c. Replace compressor (para 6-13).
5. Compressor starts but goes out on overload.	a. Suction pressure too low. b. Discharge pressure too high.	a. Check refrigerant circuit components. Replace as necessary. b. Check system pressures. Replace faulty components. Recharge to correct amount of refrigerant.
6. Suction pressure inadequate.	c. Fan motor pressure switch defective. Air temperature in air conditioned space is excessively low.	c. Replace switch (para 7-27). Raise temperature control setting (para 2-11).
7. High discharge pressure.	Insufficient volume of air passing through condenser coil. (ice on coil)	Check system suction pressures. Replace valve if defective.
8. Suction and discharge pressure low.	Lack of refrigerant due to leaks.	Check sight glass for appearance of bubbles during cooling cycle. Repair leaks and recharge to correct amount of refrigerant.

Table 6-2. Normal Operating Pressures

95° Return Air to Unit					
Outdoor Ambient Temperature	50°F	75°F	100°F	110°F	125°F
GAGE PRESSURES:					
Suction	56-60	56-65	65-75	70-80	75-90
Discharge	135-155	185-205	275-295	375-380	400-420
80°F Return Air to Unit					
Outdoor Ambient Temperature	50°F	75°F	100°F	125°F	
GAGE PRESSURES:					
Suction	Minimum 56	Minimum 56	56-65	65-75	
Discharge	130-150	180-200	270-290	290-410	

Section V. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

6-9. General

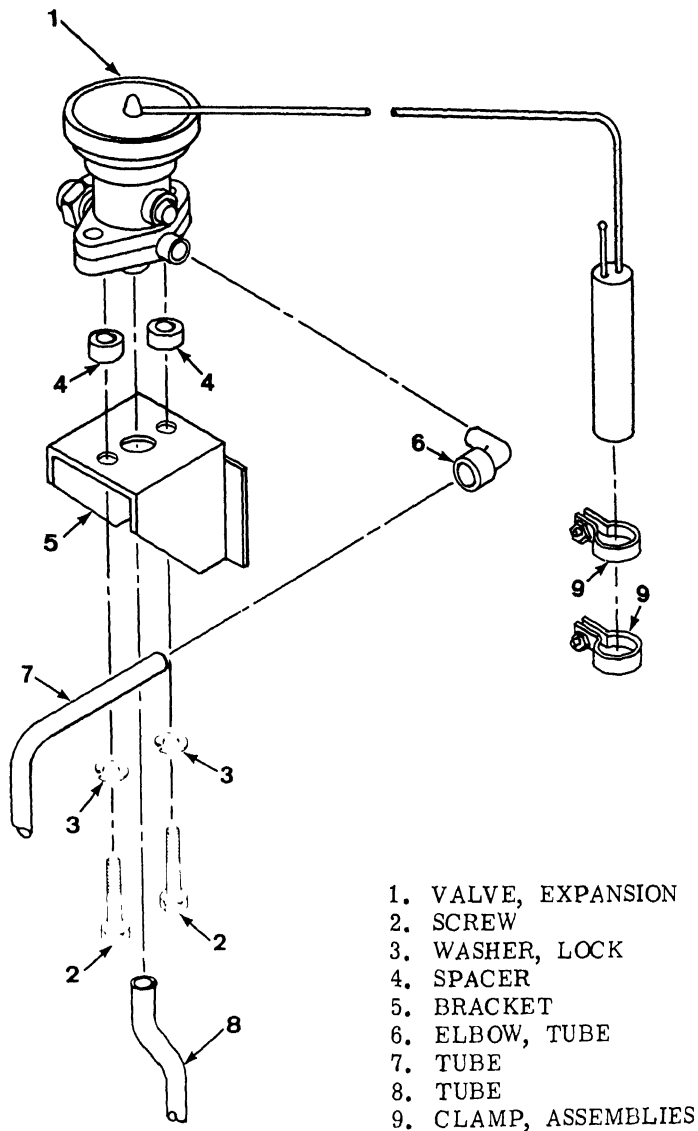
This section provides instructions for the removal and installation of all major components for the air conditioner. Removal installation for minor components such as cover panels, grilles, filters and screens are contained in Chapter 3 of this manual. The procedures included in this section are presented in logical order for complete disassembly of the air conditioner; if desired, any component may be removed as maintenance requires.

Warning: Before removing any components from the air conditioner, care must be taken to disconnect the input power to the unit. This will insure the safety of personnel and prevent damage to the air conditioner.

Warning: Refrigerant system must be discharged before opening refrigerant circuit. Refer to paragraph 7-4.

6-10. Thermostatic Expansion Valves

The unit incorporates two expansion valves; (fig 2-3, view A) an evaporator expansion valve and a bypass expansion valve. Each of these valves serves a separate purpose. The 1-ton evaporator expansion valve is in the system to meter refrigerant to the evaporator coil, as required for air conditioning load conditions. The bypass expansion valve is used to meter refrigerant to the compressor suction line in order to cool the compressor when the unit is in the bypass cycle operation.



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Figure 6-1. Thermostatic expansion valves, removal and installation.

a. Removal, (fig. 6-1.)

(1) Drain the refrigerant system, para 7-4b).

(2) Remove 20 screws, securing the top panel, and remove panel from the air conditioner.

(3) Remove screws and clamps (9), securing the sensing element for the expansion valve to be removed.

(4) Remove 2 screws (2), securing the valve (1) to the unit, and remove the top portion of the valve.

(5) Melt solder and disconnect refrigerant tubes (7 and 8) if required.

b. Installation, (fig. 6-1). Installation of the thermostatic expansion valves shall be in reverse order of removal. Be sure that all soldered connections are tight. Service the refrigerant system and adjust new expansion valves as described in Chapter 7.

6-11. Evaporator Coil

a. Removal, (fig. 6-2).

(1) Remove 20 screws, securing the top panel, and remove the panel.

(2) Remove 6 screws, securing the discharge grille, and remove the grille.

(3) Remove the mist eliminator and bracket. Remove the 1-ton expansion valve (para 6-10 and fig. 6-1).

(4) Unsolder refrigerant line connection to the expansion valve body after discharging the system.

(5) Remove the condenser fan, baffle and guard and 3 bolts in evaporator suction flange connection. Remove "O" ring (para 3-44).

(6) Remove eight screws (2), securing the coil to the case assembly, and carefully lift the evaporator coil from the air conditioner.

b. Installation, (fig. 6-2). Installation of the evaporator coil shall be in reverse order of removal. Refrigeration system must now be serviced as described in Chapter 7.

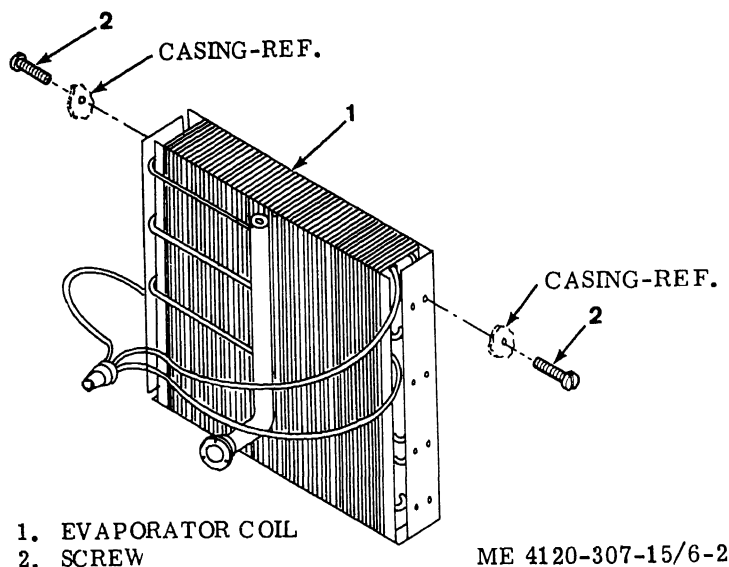


Figure 6-2. Evaporator coil removal and installation.

(5) Remove eight screws (2), securing the condenser coil assembly (1) to the air conditioner case and remove the assembly.

(6) Unsolder the refrigerant lines from the receiver; remove the screw, nut and washer holding the receiver clamp; and remove the clamp and receiver.

c. Installation, (fig. 6-3). Installation of the condenser coil, subcooler and receiver shall be in reverse order of removal. Refrigeration system must now be serviced as described Chapter 7.

6-12. Condenser Coil, Subcooler and Receiver

a. General. The condenser coil, subcooler and receiver are removed from the air conditioner as a single unit. The receiver may then be further disassembled from the assembly, but the condenser coil and subcooler are an integral unit and cannot be disassembled further.

b. Removal (fig. 6-3).

(1) Remove eight screws and remove the condenser grille and screen.

(2) Remove two screws and remove the front panel.

(3) Remove junction box assembly (para 3-46).

(4) Discharge the refrigerant system and unsolder the refrigeration lines.

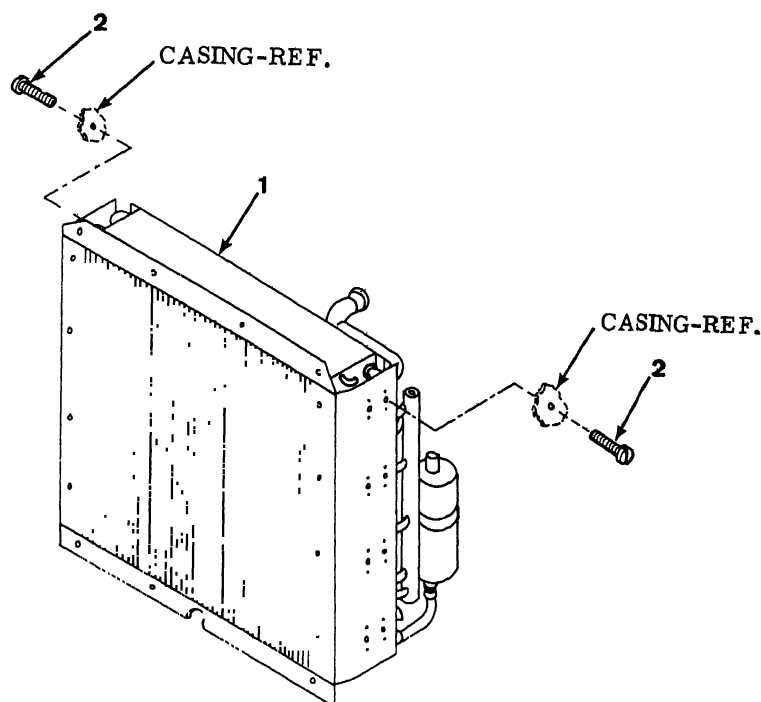
Warning: Refrigerant system must be discharged before opening refrigerant circuit. Refer to paragraph 7-4.

6-13. Compressor Assembly

a. Removal, (fig. 6-4).

(1) Remove two screws from the front panel and remove the panel.

(2) Remove junction box assembly (para 3-46).



1. CONDENSER COIL ASSEMBLY
2. SCREW

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Figure 6-3. Condenser coil, subcooler and receiver removal and installation.

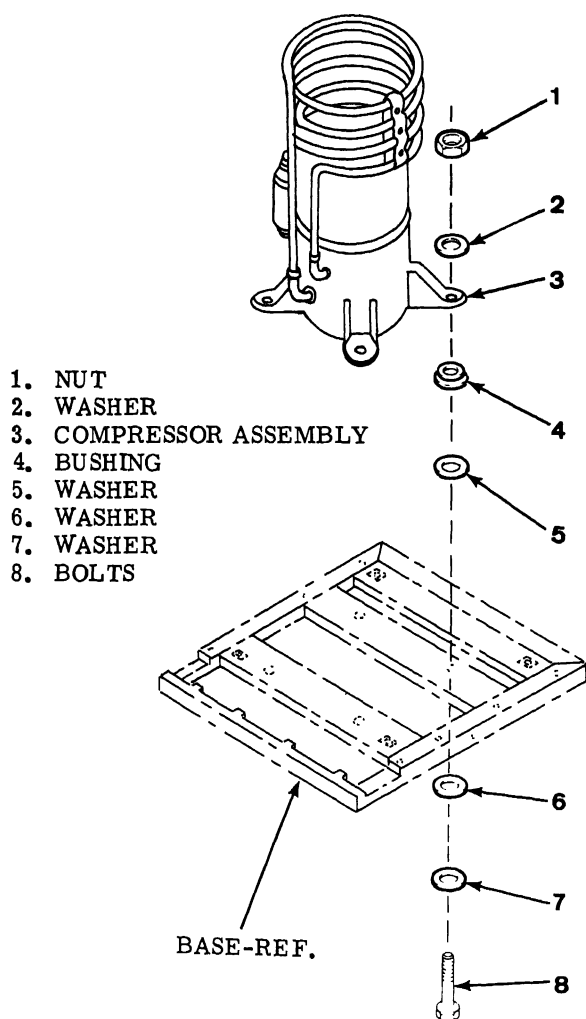
(3) Discharge refrigerant from system and disconnect the electrical connector P4 from J4 on the compressor motor.

(4) Remove insulation from suction tube. Melt solder and disconnect suction and discharge tubes from the compressor.

(5) Remove casing screws and bottom condenser screws and lift air conditioner from box (fig. 7-12).

(6) To remove compressor (3) from base, first remove 4 nuts (1), washers (2), bolts (9) and mounting bushings (4) from the compressor mount, then lift the compressor from the base.

b. *Installation*, (fig. 6-4). Installation of the compressor assembly shall be in reverse order of removal. Service the refrigeration system as described in Chapter 7 of this manual.



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Figure 6-4. Compressor assembly, removal and installation.

CHAPTER 7

REPAIR INSTRUCTIONS

Section I. SERVICING THE REFRIGERATION SYSTEM

7-1. General

This section provides instructions for servicing the refrigeration system as an assembly. The instructions include methods for checking the system for operation, proper charge and for leaks in the system. It also includes instructions for draining, purging, pressure testing, evacuating and recharging the system.

7-2. Analysis of Operation

a. General. The degree of cooling provided by the unit is controlled by a five position selector switch, temperature control (thermostat) and a high-low fan speed toggle switch.

(1) When the selector switch is in the OFF position, all components of the air conditioner shall be inoperative and deenergized.

(2) With the selector switch in the VENT position and the fan speed switch in the HIGH position, the evaporator-condenser fan motor is energized and operating at high speed. The compressor motor and heaters are deenergized and inoperative.

(3) By putting the selector switch in VENT position and the fan speed switch in LOW position, the evaporator-condenser fan motor is energized and operating at low speed. The compressor motor and heaters are deenergized and inoperative.

b. Cooling Cycle of Operation. The fan motor and compressor run continuously, whether the temperature control is calling for cooling or not, when the unit is adjusted to operate on the cooling cycle of operation. This feature provides a constant electrical load, which prevents voltage fluctuations within the system.

c. Bypass Cycle of Operation. When the conditioned air temperature falls below the temperature control setting, the circuit, which controls the solenoid valve, is energized causing the liquid line solenoid valve to close. This stops the flow of liquid refrigerant to the evaporator coil. This stops the cooling function completely, and bypasses a small amount of liquid refrigerant into

the suction line through a thermostatic expansion valve. Suction pressure is maintained by hot gas bypass through the fluid pressure regulator.

7-3. Refrigerant Charge Checks

a. Operate unit continuously for a minimum of 30 minutes.

b. While unit is operating, observe the sight glass. (cooling cycle only)

c. If refrigerant passing through sight glass is clear and cooling is being produced, it may be assumed that the refrigeration system is adequately charged.

d. If the refrigerant passing through the sight glass contains bubbles or appears milky, the system may require additional refrigerant or the dehydrator may require replacing.

7-4. Refrigerant Servicing

a. Testing for Leaks.

(1) *Halide torch detector.* This is the preferred method of testing for leaks in the refrigeration system if an electronic halogen tester is not available. Pass the exploring tube slowly over all sweat fittings, mechanical couplings and valves. If refrigerant is leaking from the system, the flame of the halide torch will change from blue to green when the leak is small. If the leak is large, the flame will be dense blue with a reddish tip; or a large leak may extinguish the torch. Mark all spots where leaks are noticed. Drain system (*b* below), repair any leaks and pressure test (*d* below).

(2) *Soap solution method.* Brush all possible points of leakage with soap solution, and watch for soap bubbles. Follow a definite sequence so all points will be thoroughly tested. Wipe the soap solution from all joints and mark any spot where a leak occurs. Drain the refrigeration system (*b* below).

b. Draining Refrigeration System.

Note. Air conditioner is equipped with two service fittings located behind the fresh air inlet screen. These fittings or valves contain a Schrader type insert and consequently require hose connectors which contain a valve opening device.

(1) Remove five screws and remove the fresh air inlet screen for access to charging valves.

Note. Make certain tank of suitable construction to hold and is of sufficient Refrigerant-22 capacity to hold refrigerant charge from unit. Salvage of refrigerant is only recommended when new refrigerant is not available. Use a clean dehydrator when recharging used refrigerant back into the system.

(2) Connect a suitable hose securely to the empty refrigerant tank. Remove cap and connect other end of hose to the discharge line charging valve. Loosen hose connection at the tank momentarily to purge air from hose.

Warning: Avoid bodily contact with liquid refrigerant and avoid inhaling of refrigerant gas. Be careful that Refrigerant-22 does not contact the eyes. In case of refrigerant leaks, ventilate area immediately.

(3) Open tank valve and operate unit on cooling cycle to pump out refrigerant.

(4) Stop the unit. Close tank valve and disconnect hose from charging valve and replace cap.

(5) Replace fresh air inlet screen.

c. Purging of Contaminated Refrigerant.

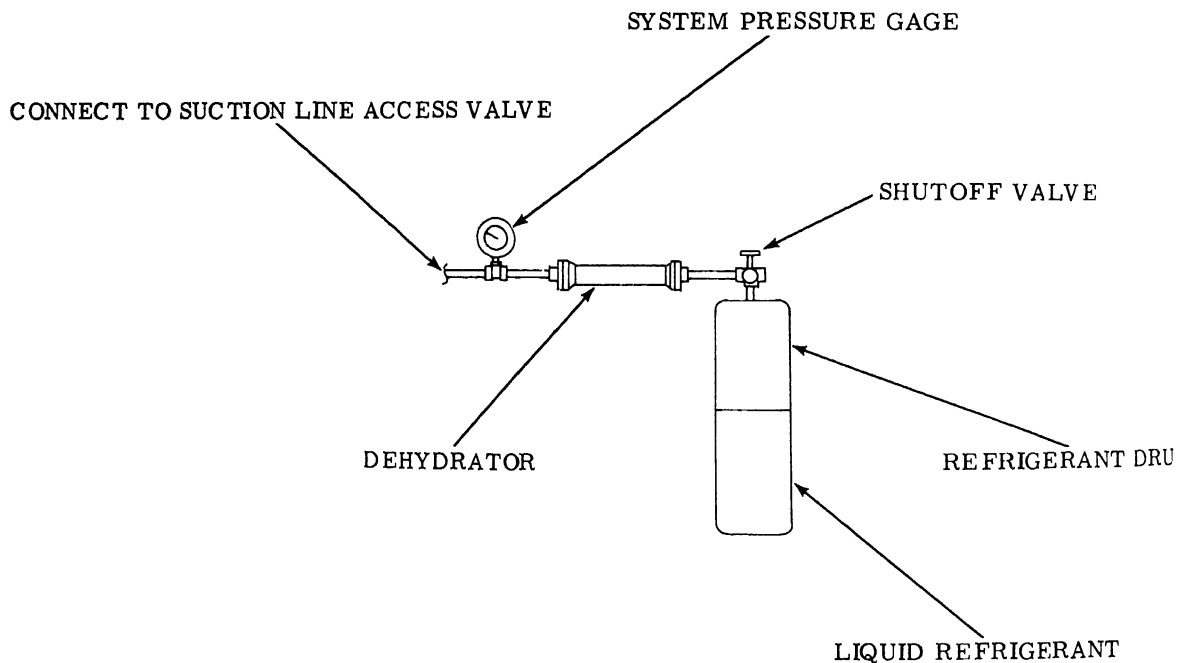
(1) Remove five screws and remove the fresh air inlet screen.

(2) Prepare to attach a suitable discharge line to the charging valve with the other end of the hose in a safe area.

(3) Connect the hose and discharge contaminated refrigerant.

(4) Install fresh air inlet screen.

Warning: Avoid bodily contact with liquid refrigerant and avoid inhaling of refrigerant gas. Be careful that Refrigerant-22 does not contact the eyes. In case of refrigerant leaks, ventilate area immediately.



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Figure 7-1. Refrigerant charging hookup.

d. Pressure Testing and Evacuating.

(1) The two charging valves are located behind the fresh air inlet screen. Remove the inlet screen.

(2) Refer to figure 7-1 and make up a charging hookup as shown.

(3) Remove cap from suction line charging valve and connect the charging hookup to the charging valve.

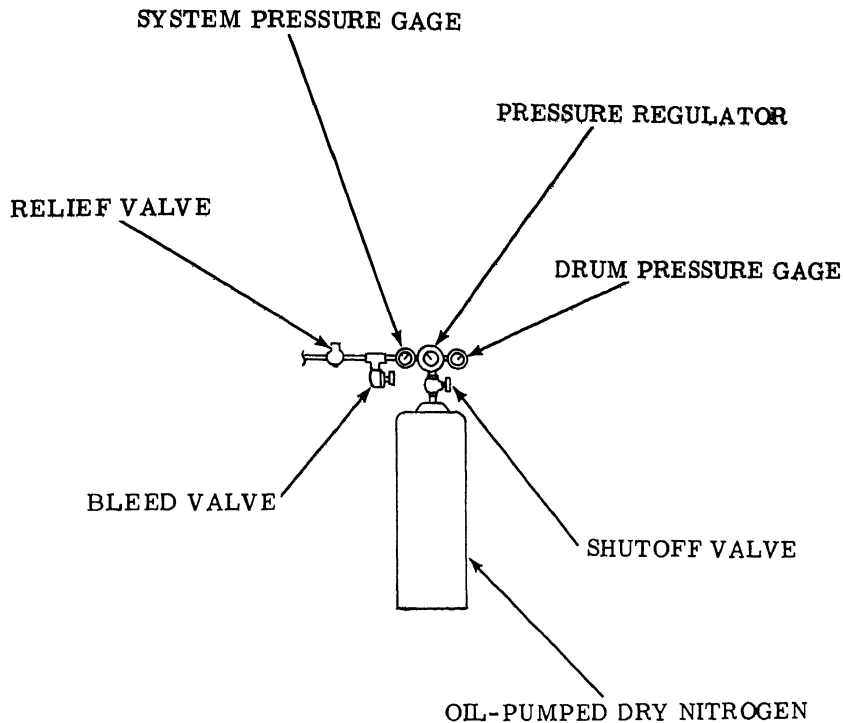
(4) Open shutoff valve to full open.

Note. Refrigerant drum must be in upright position to allow only gaseous refrigerant to enter system.

(5) Add refrigerant, until system pressure gage reads 50 psig (pounds per square inch gage) minimum. Close the drum shutoff valve.

(6) Disconnect charging hookup and connect the pressure testing hookup (fig. 7-2) to the suction line charging valve.

(7) Open the shutoff valve to full open.



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Figure 7-2. Refrigerant pressure testing hookup.

(8) Add nitrogen and adjust pressure regulator until drum pressure gage reads 150 psig. Close the drum shutoff valve.

(9) Test system for leaks. See paragraph 7-4.

(10) If no leaks are detected, disconnect the pressure testing hookup. Connect a suitable hose to the discharge line charging valve to allow test gases to escape.

(11) Remove cap from discharge line charging valve. Attach a suitable vacuum pump to discharge line charging valve and a manometer to suction line charging valve. With the charging valves open, operate vacuum pump until manometer indicates 2.5 mm (millimeters).

(12) Close valve at vacuum pump and stop pump. Allow unit to stand under vacuum for one

hour. If no noticeable rise in pressure occurs, the system is ready for charging. Disconnect manometer from suction line charging valve and connect the refrigerant charging hookup to this valve. Operate vacuum pump for another thirty (30) minutes. Close vacuum pump valve and stop pump.

e. Charging the System.

(1) Refer to figure 7-1 showing the refrigerant charging hookup. Install pressure gages before attempting to charge the system. Open the refrigerant drum valve to put a positive pressure in the system.

(2) Disconnect the vacuum pump from the discharge line charging valve and connect a suitable pressure gage to this valve.

(3) Set refrigerant drum in upright position so that only gaseous refrigerant will enter system. To speed up charging, set refrigerant drum in warm water. Never use a heating torch for this purpose.

(4) Set temperature control switch above ambient or room temperature. Open refrigerant drum shutoff valve. Operate unit in the cool position and weigh in 8 lb. charge of refrigerant-22. Continue adding refrigerant slowly until sight glass indicates full.

(5) Operate unit in cool position only during servicing operation.

(6) Partially block discharge grille with a cardboard baffle. Adjust baffle until suction pressure gage reads 55 psig. Continue adding refrigerant slowly, while maintaining 55 psig suction pressure by adjusting the baffle, until the discharge pressure gage reading corresponds to the ambient temperature. Refer to figure 7-3. Close refrigerant drum shutoff valve. Stop the unit. Disconnect charging and gage hoses from charging valves and install caps.

**DISCHARGE PRESSURES
AT CONSTANT 55° PSIG SUCTION
AMBIENT FROM 70°F TO 125°F**

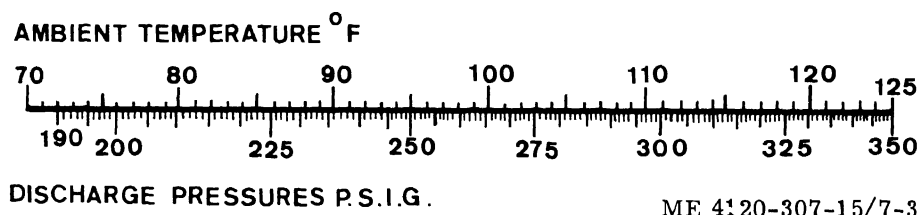


Figure 7-3. Discharge pressure for ambient temperature range.

7-5. Tubes and Fittings

Warning: Before removing any components from the refrigeration fluid system, the Refrigerant-22 must be drained. Refer to paragraph 7-4.

Note. If the refrigerant system has been open to the atmosphere for any length of time due to tube breakage or other reasons, replace the dehydrator.

a. The refrigeration tubes used on the air conditioner consist of copper tubing and the necessary fittings. Joints of refrigeration tubes are soldered. Inspect the tubes and tubing for cracks and breaks. Replace defective tubes with those of the same length, size, shape and material. When removing or installing solenoid valves or expansion valves refer to the applicable paragraph and disassemble the unit before applying heat in the vicinity of the valves. If too much heat is trans-

ferred to the internal mechanism of the valves, damage will result.

b. When a tube or fitting has been soldered into the system it should be checked for leaks and the system serviced as described in paragraphs 7-3 and 7-4. Always replace holding clamps, insulation and rubber grommets where they were removed or damaged from excessive heat.

c. Flare nuts should be torqued as required (para. 6-4) when they are being installed on components that were removed. Flare nut connections should also be checked for leaks as described in paragraphs 7-3 and 7-4.

Note. If the refrigerant system has been open to the atmosphere for any length of time, due to the tube breakage or component replacement, replace the dehydrator. Pressure test and evacuate the system before charging.

Section II. SERVICING THE ELECTRICAL SYSTEM

7-6. General

This section provides instructions for servicing the electrical system as an operating system. The instructions include methods for checking the system for operation and for isolating a malfunction or fault in the system.

7-7. Analysis of Operation

a. General. The electrical system helps provide control for the air conditioning system, drives the compressor and circulating fans and provides the heat for the heating mode of operation. The heart of the electrical control system is the control panel where a selector switch, thermostatic control and toggle switch are used to manually select the various modes and conditions of operation. Four basic modes of operation are available.

b. Cooling Cycle. A phase sequence relay and circuit breaker controls two phases of the three phase power to a control voltage transformer. This transformer reduces the 208 volt power to a safe 30 volts. The reduced ac voltage is rectified to a pulsating dc and used to operate the system control circuits. The control voltage operates relays and solenoids, which in turn connects the three phase voltage to the compressor motor and to the fan motor. The toggle switch on the control panel controls the speed of the two speed fan motor (when S-3 is open).

c. Venting Cycle. In the venting cycle of operation, the control voltage is switched off of certain relays and solenoids which de-activates both the refrigeration and heating circuits. The fan motor circuit is kept energized in this mode and may be operated in either low speed or high speed.

d. Low Heat Cycle. In the low heat mode of operation, a set of relay contacts energizes a set of heaters with the three phase power. The heat is distributed with the fan motor in either low speed or high speed operation.

e. High Heat Cycle. In the high heat mode of operation, a second set of heaters are connected in parallel with the low heat heaters through the selector switch. The second set of heaters are identical to the set used in the low heat cycle; thus providing twice the wattage output in the high heat mode.

f. Electrical System Protection. Several protection devices are included in the electrical system to protect against overloads and overheating.

(1) Two 1.6 amp fuses are installed in the primary voltage line to the control voltage transformer and protect the input power circuit from overload.

(2) One five amp fuse are installed in the dc control voltage line. This fuse protects the control voltage transformer and rectifier from overload.

(3) Thermal protectors are included on the compressor motor and on the fan motor to protect the motors and input circuits from overload and overheating.

(4) A thermal protector is included in the heater circuit and installed near the heaters to protect them from failure in the event of overheating from failure of air flow.

(5) A high and low pressure safety switch turns off the refrigeration operation in the event of high or low pressure in the refrigeration system. The switches operated from the refrigeration system pressure, control the voltage to the refrigeration electrical control circuits.

(6) A circuit breaker, in the three phase line to the compressor, with an auxiliary switch in the primary line to the control voltage, provides for protection against compressor overloads. In the event of compressor overload, the circuit breaker trips, opening both the three phase line to the compressor and the control circuit.

(7) A phase sequence relay connected in the input power line prevents the compressor from starting if phase sequence is not correct.

(8) A pressure switch operated by the refrigeration system discharge pressure bypasses the fan speed toggle switch during high temperature cooling operation for high speed only.

(9) A time delay relay prevents simultaneous compressor motor and fan motor startup. When the selector switch is placed in the cool position the compressor motor starts 30 seconds after the fan motor.

7-8. Isolation Procedure

a. General. When malfunctions occur in the air conditioner procedures are provided to aid the technician in locating the faulty component. The procedures are designed around the three primary malfunctions that can occur in the air conditioner: air flow, refrigeration or heat.

b. Air Flow. Air flow directly affects refrigeration or heating and in the event of any type failure the air flow should be checked first.

(1) Place the selector switch in the VENTILATE position and check for air flow by feel and listening for fan motor operation.

(2) If motor operates but flow is insufficient, check grille louver position, check filters and screens for cleanliness, then check fan blades for looseness.

(3) If fan motor fails to operate at low speed, with HI-LO switch in the LO position, check selector switch contacts 3C to 3I and 2B to 2J, relay contact K4 and K5, fan motor thermal protector and pressure switch S3.

(4) Place HI-LO switch in the HI position. If fan motor fails to operate at high speed in the VENTILATE mode, check circuit breaker CB1 reset, phase sequence and control circuit fuses.

Note. Always wait five minutes after circuit breaker has automatically turned system off before manually resetting the device.

(5) If fan motor operates in low speed only, check relay K4 and K5 coils, toggle switch contacts, the normally open contacts of K4 and K5, phase sequence and control circuit fuses.

(6) If motor still fails to operate or operates improperly, check voltage across motor windings.

c. Refrigeration. Proper refrigerant charge, compressor operation and air flow are the three basic requirements for refrigeration operation. Check air flow as outlined in paragraph *b* above.

(1) Place the selector switch in the COOL position, and rotate thermostat to extreme decrease position. Wait for five minutes then check air flow for coolness and listen for compressor operation.

(2) If compressor operates but cooling is insufficient, check refrigerant through sight glass.

(3) If compressor fails to operate, check three phase voltage on load side of circuit breaker then check same voltage on load side of K1 contacts.

(4) Check temperature control thermostat. Reset pressure switches S6 and S7. Measure control voltage on load side of pressure switch contacts.

(5) Check relay coil K3 and its time delay contacts. Check relay coil K1 and solenoid valve L2.

d. Heating. Heat from the heaters and air flow are the two basic requirements for heating operation. Check air flow as outlined in paragraph *b* above.

(1) Place the selector switch in the LO HEAT position and the temperature control in the extreme clockwise position. Wait for five minutes then check air flow for heat.

(2) Measure voltage on load side of relay K contacts. Check thermal protector S4.

(3) Measure voltage on load side of thermostat and on load side of thermostat and on load side of selector switch contacts 1A to 1J.

(4) Check relay K2 coil.

(5) Place selector switch in HI-HEAT position and check second set of heaters operation.

(6) Measure voltage on load side of selector switch contacts 3A to 3J, 4A to 4J and 4C to 4I.

(7) Measure voltage across each set of heaters to isolate a particular heater that is malfunctioning.

Section III. COMPONENTS REPAIR

7-9. General

This section provides instructions for repairing all repairable components within the air conditioner. Where applicable the procedures include: disassembly, cleaning, inspection, repair, replacement and reassembly. Removal and installation of all components requiring adjustment are included in Section IV of this chapter.

7-10. Fan Motor

a. General. The two speed fan motor may be disassembled and any worn or defective parts replaced in the procedures that follow.

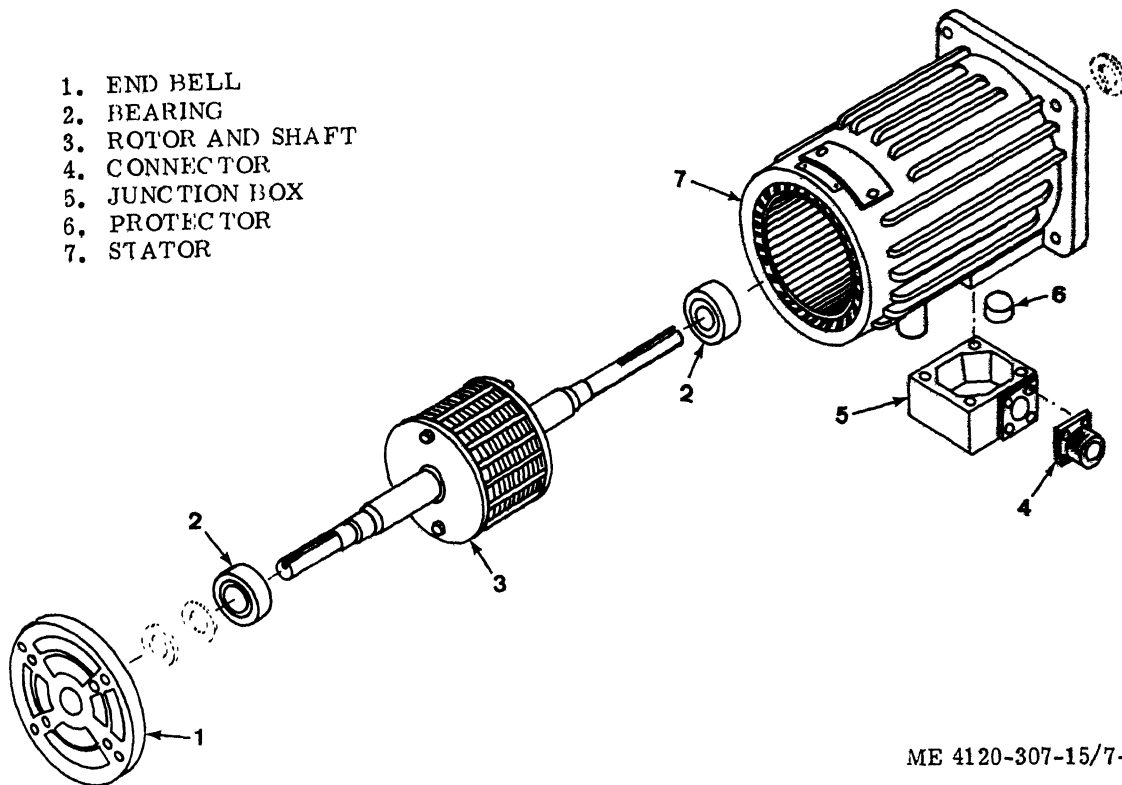
b. Disassembly (fig. 7-4).

(1) Remove the retainer screws securing the end bell (1) on the motor and remove the end bell.

(2) Carefully remove the rotor and shaft assembly (3) from the stator assembly (7).

(3) Remove the bearings (2) from the end bell and from the stator assembly.

(4) Remove four screws securing the electrical connector (4) to the stator assembly. Pull the connector out as far as the wires will permit to extend then unsolder the wires. Be sure each wire is marked for later identification.



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Figure 7-4. Fan motor, exploded view.

(5) Remove four screws securing the junction box (5) to the stator housing (7) and remove the box.

(6) Disconnect wires from the thermal protector (6) and remove the protector from the stator assembly. Be sure each wire is tagged for later identification.

c. Cleaning.

(1) Clean all parts in dry cleaning solvent, Federal Specification P-S-661. Use a stiff bristle brush to brush away dirt, scale and other foreign matter.

(2) Use compressed air to blow out loose material in hard to get to areas. Do not spin the bearings with compressed air.

(3) Using a soft cloth carefully wipe all machined surfaces with a light oil. Coat the bearings with a light oil.

d. Inspection.

(1) Check the bearings for discoloration, fractures, wear, pits, etc.

(2) Check the rotor for signs of dragging, check its shaft for signs of wear or corrosion.

(3) Using a suitable ohmmeter, measure the resistance of the stator windings as follows:

T3 to T6 approximately 1 ohm

T3 to T9 approximately 1 ohm

T6 to T9 approximately 1 ohm

T1 to T4 approximately 1 ohm

T1 to T7 approximately 1 ohm

T4 to T7 approximately 1 ohm

T2 to T5 approximately 1 ohm

T2 to T8 approximately 1 ohm

T5 to T8 approximately 1 ohm

(4) Using the ohmmeter check the thermal protector by checking the continuity across terminals as follows:

T1 to T2 approximately 0 ohms

T1 to T3 approximately 0 ohms

T2 to T3 approximately 0 ohms

(5) Inspect the stator housing for signs of cracking. Check the pole pieces for signs of rotor dragging.

(6) Check the electrical connector for bent pins, corrosion and fractures.

(7) After the motor is reassembled, check the motor shaft for freedom to turn. Shaft should turn freely without any signs of dragging or binding.

e. Repair or Replacement.

(1) Replace bearings that show discoloration, fractures, wear, pits, etc.

(2) If rotor shows defects or fractures or its shaft shows wear, replace.

(3) Replace stators with shorted or open windings. Replace defective thermal protectors.

(4) Replace damaged electrical connector.

f. Reassembly. Reassembly shall be in reverse order of disassembly. Make sure all wires are resoldered to their proper connections.

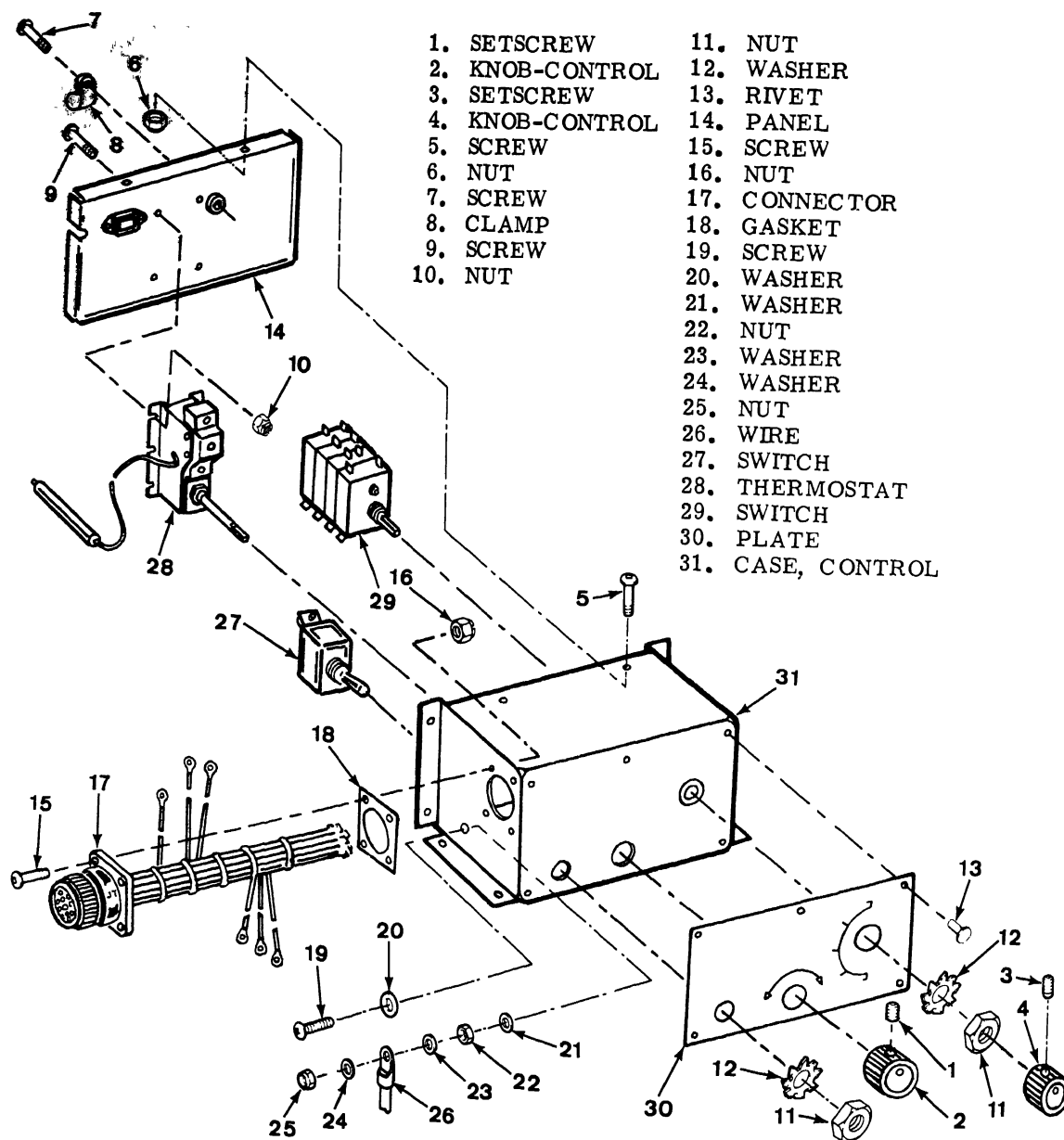


Figure 7-5. Control panel assembly, exploded view.

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7-11. Panel Control

a. General. The control panel contains the electrical switches that enable the operator to select the appropriate method of heating, cooling or ventilation required at a given time. This panel may be disassembled, inspected and defective parts replaced as required.

b. Disassembly, (fig. 7-5).

(1) Remove the front access panel and the intake grille by removing the screws shown on figure 1-1. Remove the air filter (fig. 3-2). Disconnect the temperature sensing bulb (fig. 3-6) and push it down through the grommet until it is out of the way.

(2) Disconnect the electrical power cable to the control panel.

(3) Remove the four screws (2, fig. 3(9)) that secure the control panel to the top of the junction box.

(4) Remove the knobs (2 and 4) from the front of the panel by removing the screws (1 and 3). Remove nuts (11) and washers (12), screws (13) and plate (30).

(5) Remove the rear panel (14) by removing screws (7 and 9), nut (6), clamp (8) and nut (10).

(6) Remove nuts (16). Remove screws (15), connector and wiring harness (17) and gasket (18) by first disconnecting wiring harness leads and tagging them.

(7) Disconnect ground wire lead (26) by removing screw (19), washers (20, 21, 23 and 24) and nuts (22 and 25).

(8) Remove toggle switch (27), thermostat switch (28) and rotary switch (29).

c. Inspection. Inspect all components of control panel assembly for cracks, breaks and dirt or other foreign substance.

d. Cleaning. Clean all parts in dry cleaning solvent, Federal Specification P-S-661. Use a stiff bristle brush to brush away dirt, scale, and other foreign matter. Use low pressure, dry, compressed air to blow cleaned components dry.

e. Repair or Replacement. Replace all defective parts.

f. Reassembly. Reassembly shall be in the reverse order of disassembly. Make sure all tagged wires are connected to the parts to which they belong.

7-12. Junction Box

a. General. The junction box is the electrical nerve center of the air conditioner. Contained herein are the relays, terminal boards, circuit breaker and rectifier. This box may be disassembled, components inspected, tested, and defective parts replaced as required.

b. Disassembly, (fig. 7-6).

(1) Refer to paragraph 7-11 to gain access to the junction box.

(2) Remove the control panel from the junction box top as described in paragraph 7-11.

(3) Disconnect and tag the two electrical cables from the rear of the junction box.

(4) Unscrew the white knob from the circuit breaker reset linkage (fig. 2-2). Pull the pin (8, fig. 3-10) from the circuit breaker at the bottom of the linkage and remove linkage.

(5) Loosen two screws on each side of box and remove junction box assembly.

(6) Remove the front cover (13) of the junction box by removing the four screws (14).

(7) Disconnect the tag leads to circuit breaker (24). Remove the six screws (27) holding the circuit breaker and remove the circuit breaker (24) from the junction box.

(8) Remove the three fuses (43) from the fuse holders.

(9) Disconnect and tag the leads from the transformer (12). Remove the transformer by removing the four nuts securing it to the junction box top panel.

(10) Remove the eight screws (36) from the rear of the junction box and pull forward the components panel (31) that they secure.

(11) Disconnect and tag all electrical leads.

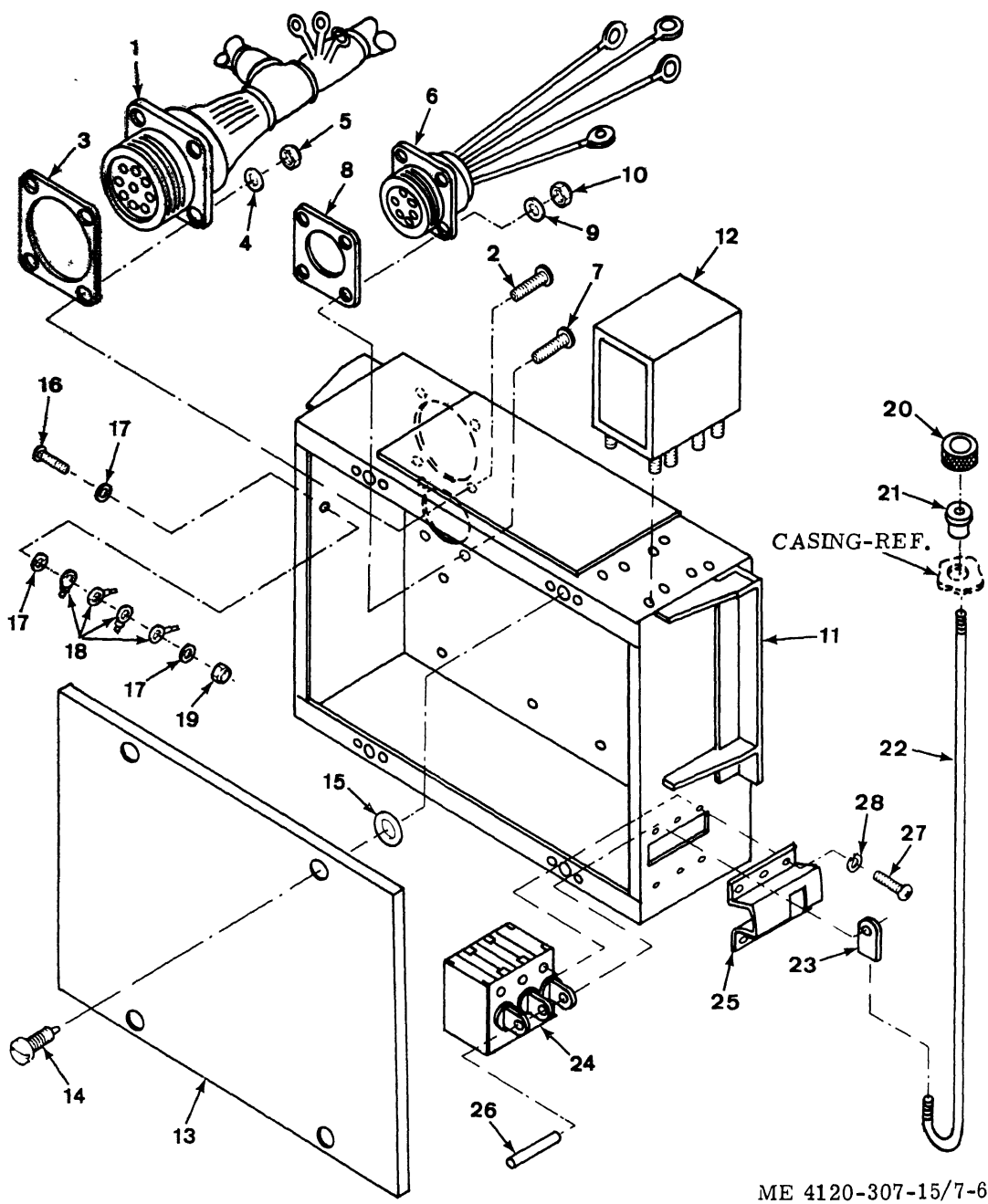
(12) Remove relays (32, 35, 52, 56, 63 and 65), fuse holders (38), and terminal boards (46 and 49) by removing screws (47 and 50). Remove wiring harnesses (1 and 6) by removing screws (2 and 7).

c. Cleaning. Clean all parts by using a stiff bristle brush to remove dirt, scale, and other foreign matter.

d. Inspection. Inspect all components for cracks, breaks, or loose connections.

e. Repair or Replacement. Replace all defective parts. Tighten all loose connections.

f. Reassembly. Reassembly shall be in the reverse order of disassembly. Make sure all tagged wires are connected to their proper posts.



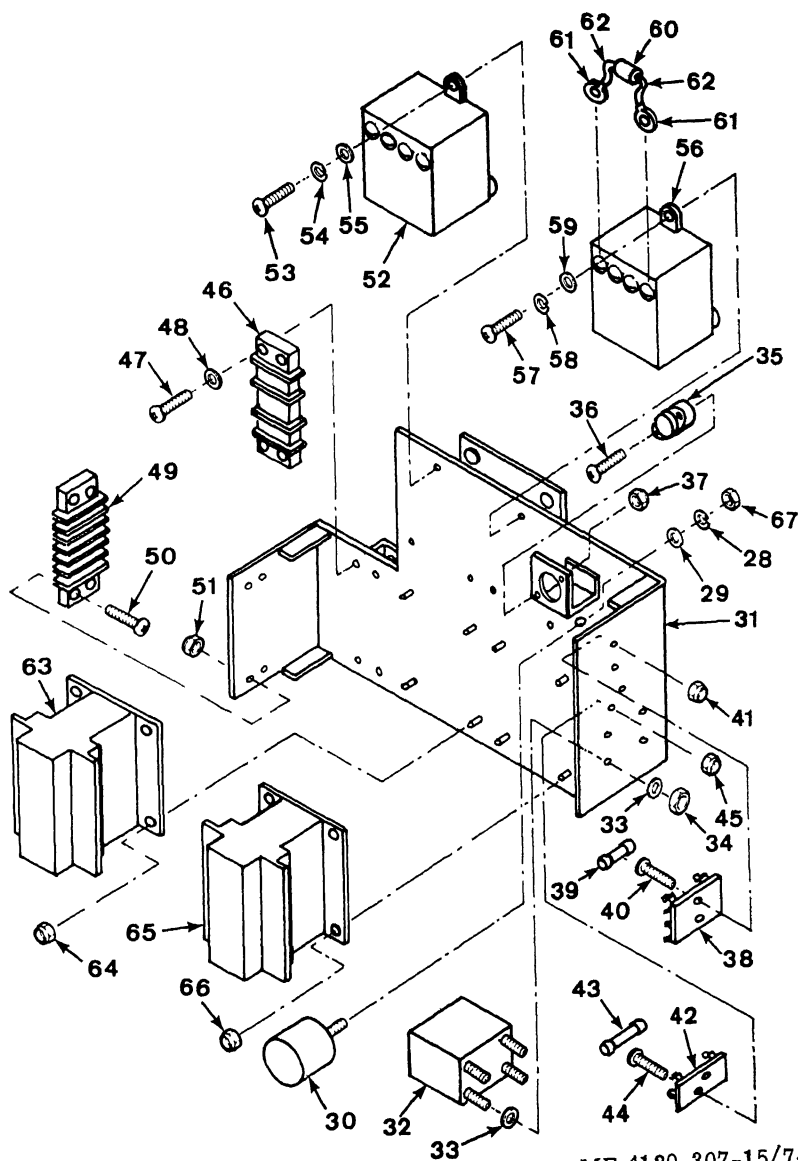
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Figure 7-6. Junction box assembly, exploded view. (sheet 1 of 2).

Wiring harness (J3)
Screw (4)
Gasket, rubber
Washer (4)
Nut (4)
Wiring harness (J2)
Screw (4)
Gasket, rubber
Washer (4)
Nut (4)
Junction box
Transformer
Cover, junction box
Screw
Washer, retainer
Screw
Washer, flat
Wiring harness
Nut, self-locking
Knob
Plug, button
Rod, linkage
Connector, linkage

24 Circuit breaker
25 Cover, circuit breaker
26 Pin, circuit breaker
27 Screw
28 Washer, lock-sprin
29 Washer
30 Rectifier, semicon
31 Panel, junction bc
32 Relay, phase seque
33 Washer
34 Nut, self-locking
35 Relay, time delay, 30 sec.
36 Screw
37 Nut, self-locking
38 Fuse holder
39 Fuse, power, time lag, 250V
40 Screw
41 Nut, self-locking
42 Fuse holder
43 Fuse
44 Screw
45 Nut, self-locking
46 Terminal board

Figure 7-6. Junction box assembly, exploded view-



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Figure 7-6. Junction box assembly, exploded view. (sheet 2 of 2) see sheet 1 for key.

7-13. Thermostatic Expansion Valves

a. *General.* Two thermostatic expansion valves are used in the air conditioner. Either of these valves may be disassembled and cleaned. Replace valve if defective.

b. *Disassembly, (fig. 7-7).*

(1) Remove the two cap screws (10) securing the body flange (9) to the power assembly (1) and remove the power assembly.

(2) Remove cage assembly (7) and two gaskets (6) and one gasket (8) from the cage assembly.

(3) Remove the seal cap (2) and bonnet seal (3) from the power assembly (1).

(4) Remove packing nut (4) from the adjusting stem (5) then remove adjusting stem.

c. *Inspection, Replacement.*

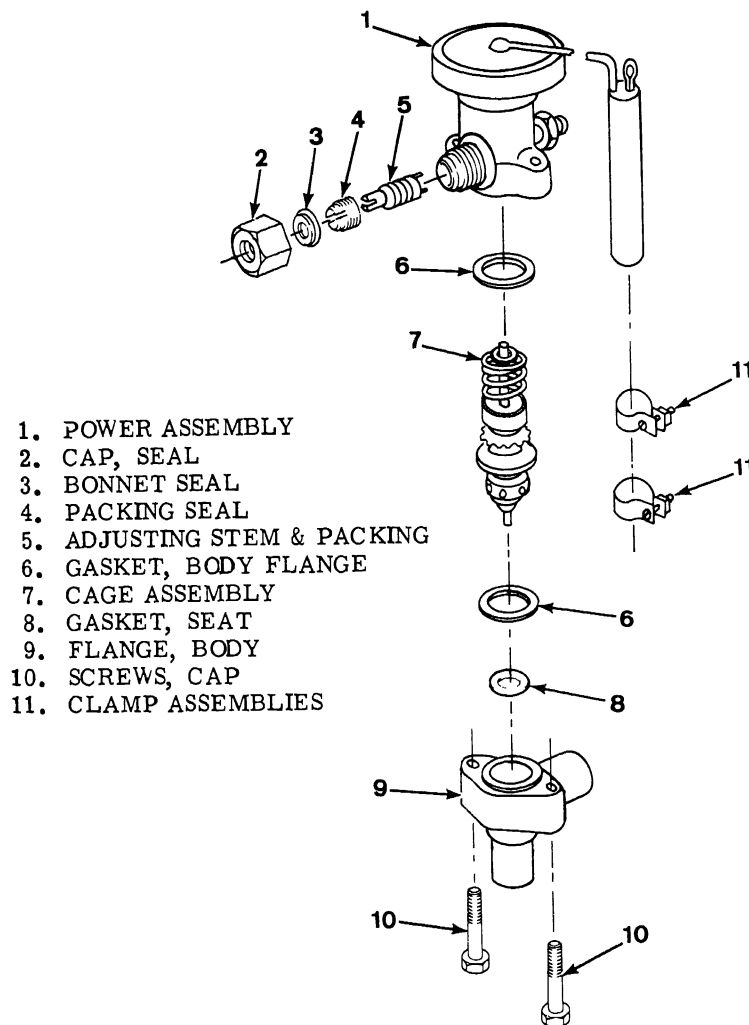
(1) Inspect all parts for cracks, abrasion, corrosion or other defects.

(2) Check the cage assembly spring for operation. Make sure the spring is not broken.

(3) Check the body flange seat for cracks, pits or any signs of improper seating.

(4) Replace any defective or broken parts. Replace all seals and packing on the adjusting stem.

d. *Reassembly.* Reassembly shall be in reverse order of disassembly. Make sure new seals are used in the reassembly process.



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Figure 7-7. Thermostatic expansion valves, exploded view.

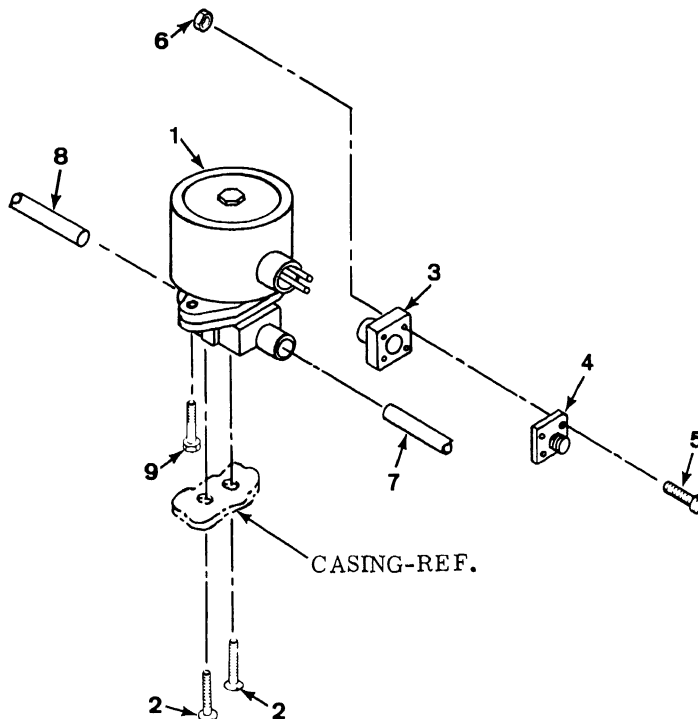
7-14. Solenoid Valves

a. *General.* Two solenoid valves are used in the air conditioner. Either of these two valves may be disassembled. Both are normally open valves. L1 (fig. 1-4) is the liquid line solenoid valve. It is controlled by the thermostat setting. Whenever the return air temperature reaches the setting of the thermostat the electrical circuit to the L1 solenoid is energized thus closing the valve to stop cooling the air. When the temperature rises, the valve is deenergized and thus opens permitting liquid refrigerant flow to the evaporator to resume cooling. The L2 solenoid valve (fig. 1-4) is the pressure equalizer solenoid and is in parallel with the compressor motor. When the compressor

stops the valve deenergizes and assumes its normally open position thus allowing pressure to equalize from the discharge to the suction side of the compressor. To determine if L1 is functioning properly, observe the sight glass and if flow is noted, valve is open. Adjust thermostat to a higher setting and flow should stop. Check L2 by removing the top panel of the unit and feel the line out of the valve. If line is warm, valve is not closing when energized. Check coil of both valves for continuity or ground by using an ohmmeter. It should read a resistance of 40 ohms.

b. *Removal, (fig. 7-8).*

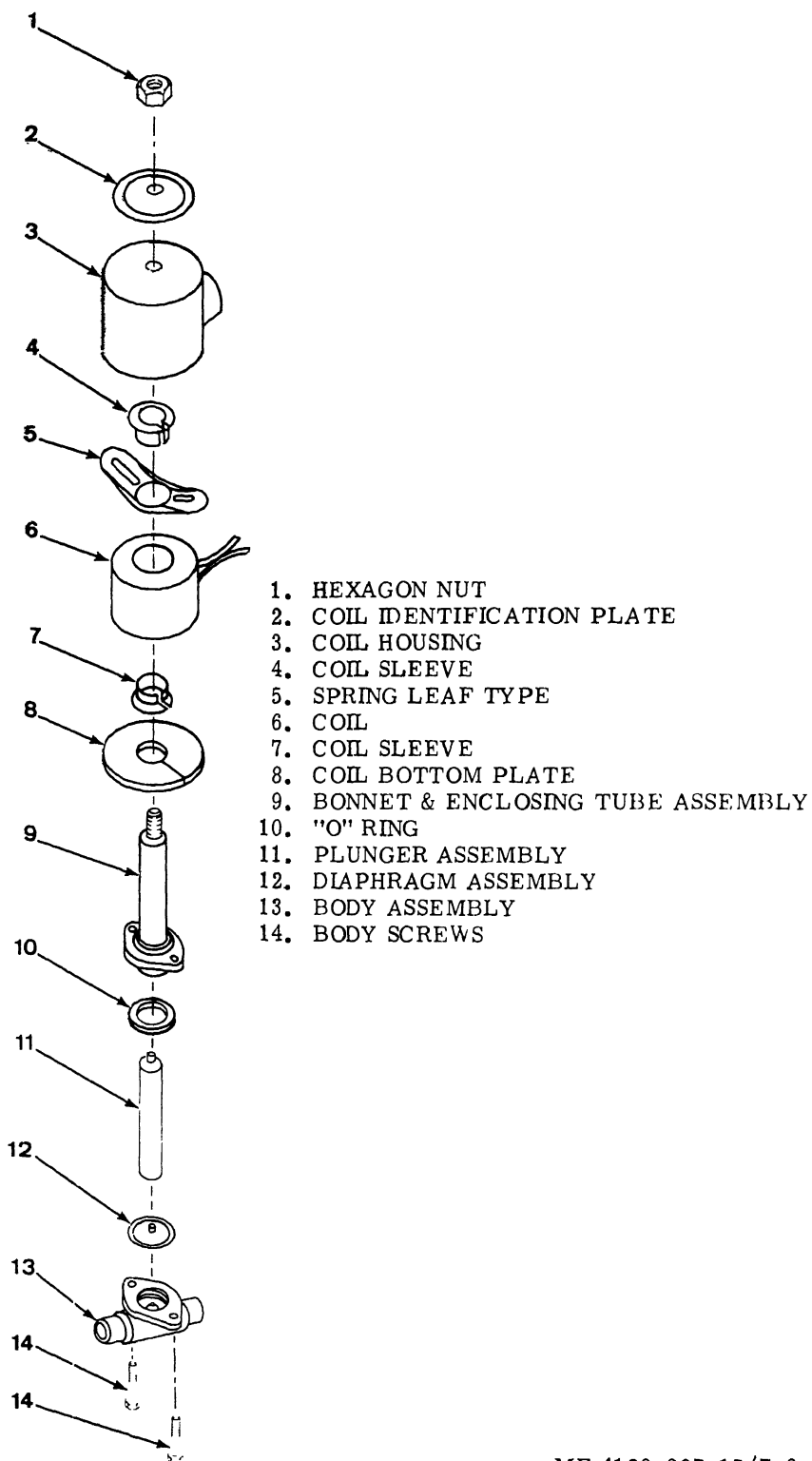
(1) Disconnect the electrical cable connector to the solenoid valve to be removed.



1. VALVE, SOLENOID
2. SCREW
3. ADAPTER
4. CONNECTOR, RECEPTACLE
5. SCREW
6. NUT, SELF-LOCKING
7. TUBE
8. TUBE
9. SCREW

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Figure 7-8. Solenoid valves, removal and installation.



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Figure 7-9. Solenoid valves, exploded view.

Caution: The solenoid valve must be disassembled before disconnecting the tubing from the valves to avoid heat distortion.

(2) Remove two screws (14) securing the lower portion of the valve to the upper assembly and remove the upper assembly. Remove the diaphragm from the lower assembly.

(3) Using heat, disconnect the tubing from the lower portion of the valve.

(4) Remove two screws securing the lower portion of the valve to the mounting bracket and remove the lower portion.

c. Disassembly, (fig. 7-9).

(1) Remove the coil retaining nut (1) identification plate (2) and coil housing (3).

(2) Remove the top coil sleeve (4) and spring (5) then remove the coil (6). Remove the bottom coil sleeve (7) and the coil bottom plate (8).

(3) Remove two screws (14) securing the bonnet assembly (9) to the body assembly (13) and remove the bonnet and enclosing tube assembly.

(4) Remove "O" ring (10), plunger assembly (11) and diaphragm assembly (12) from the body assembly (13).

or

CRACKS or any signs of improper seating.

(3) Using a suitable ohmmeter check continuity of the coil. Coil resistance should be approximately 50 ohms.

(4) Replace any broken or defective

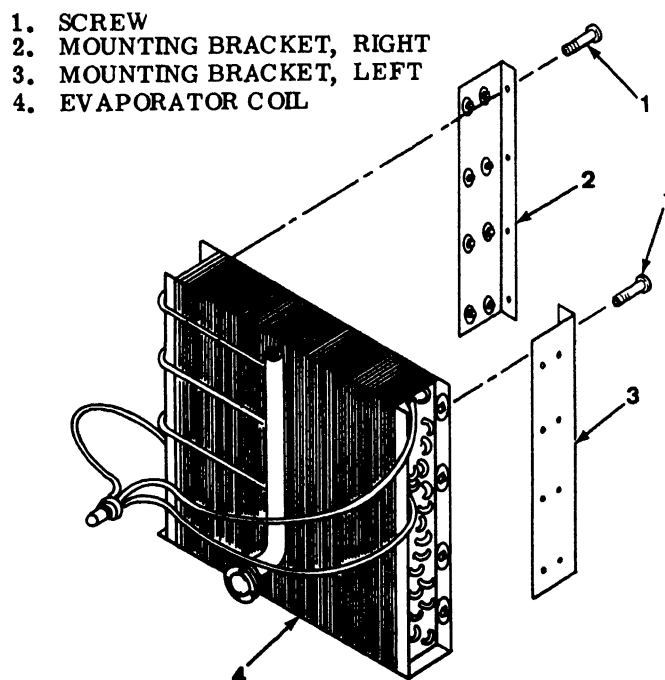
Assembly
tight.

f. Reins
solenoid v
moval. Be sure unit
tight and that the v
after connections are sol

7-15. Evaporator Coil

a. General. The evaporator coil is non-repairable, except as described under repairs below and cannot be disassembled.

b. Cleaning, Inspection, Repair, (fig. 7-10). Refer to paragraph 7-16, and clean, inspect and repair the evaporator coil in the same manner as the condenser coil.



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Figure 7-10. Evaporator coil, three-quarter view.

Warning: Refrigerant system must be discharged before opening refrigerant circuit. Refer to paragraph 7-4.

7-16. Condenser Coil, Subcooler and Receiver

a. General. The condenser coil and subcooler is an integral unit, non-repairable except as described under repairs below, and cannot be disassembled. The receiver is a non-repairable item itself, but it may be removed from the condenser coil and a new one installed when required.

b. Disassembly, (fig. 7-11).

(1) Unsolder the tubing at the top and at the bottom of the receiver (5) and free the tubing (2 and 6) from the receiver.

(2) Remove screw (3) and washer from receiver mounting clamp (4) and remove the clamp from the receiver.

c. Cleaning.

(1) Plug both ends of the condenser coil to prevent contamination entering the coil. If the receiver has been removed and is to be used again, it too should be plugged at both ends.

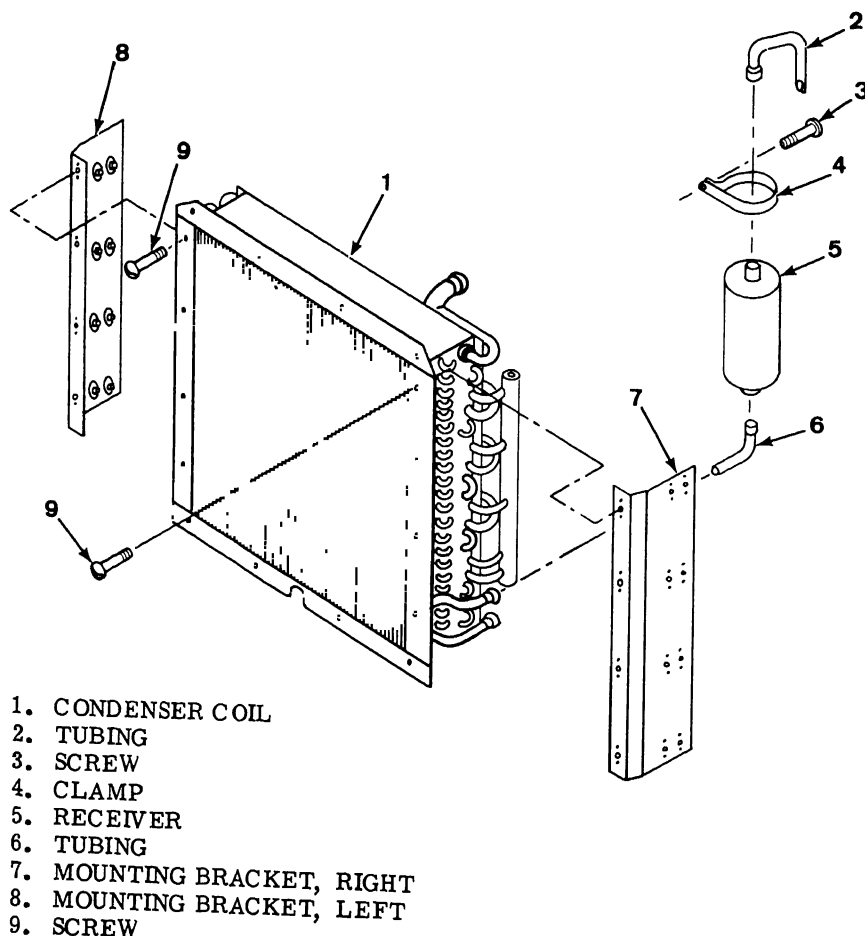
(2) Scrub the external portion of the coil with a stiff bristle brush or soft wire brush to remove scales and corrosion. Do not damage coil fins.

(3) Use compressed air to blow out loose material.

(4) Wipe the coils and flat surfaces with a cloth dampened with a dry cleaning solvent, Federal Specification P-S-661.

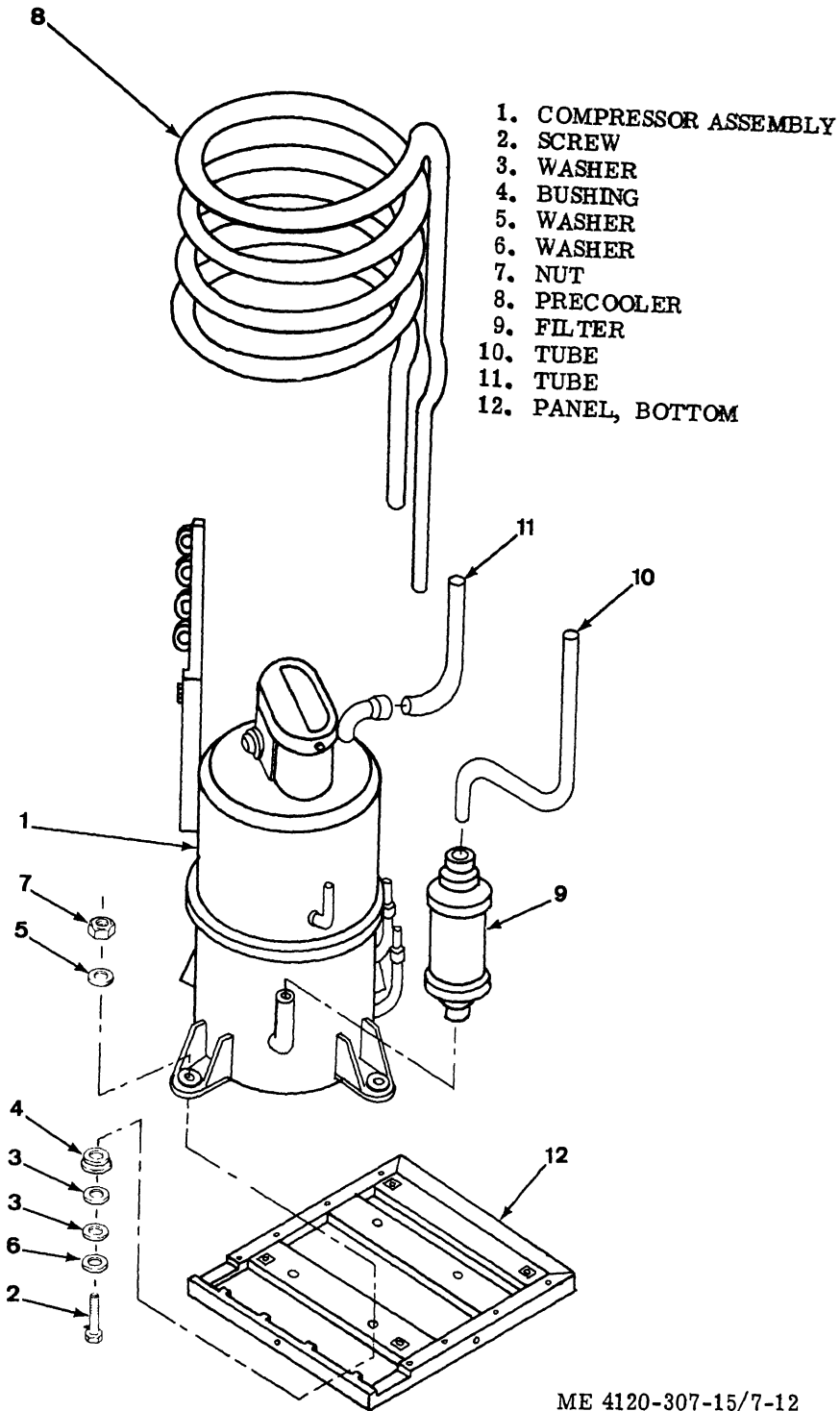
d. Inspection.

(1) Inspect the coil for bent fins, damaged coil tubes and internal leaks.



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Figure 7-11. Condenser coil subcooler, receiver, disassembly.



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Figure 7-12. Compressor disassembly and reassembly.

(2) Inspect the receiver for dents, cracks or broken solder joints at the tubing connections.

e. Repair or Replacement.

(1) Bent fins may be straightened with needle nose pliers. Resolder any solder cracks that are accessible on the coil and on the receiver.

(2) Internal leaking coils, damaged or bent coils or a bent or ruptured receiver cannot be repaired and must be replaced with a new one.

f. Reassembly. Reassemble the receiver to the condenser coil and subcooler in reverse order of disassembly.

7-17. Compressor Assembly

a. General. The compressor itself is non-repairable and must be replaced. A precooler coil, a filter and the mounting hardware for the compressor may be replaced if damage to the items has occurred. To determine if the compressor is operating normally, check with condenser air at 95°F (35°C), the return air at a reading of 80°F (26.67°C) dry bulb or 67°F (19.44°C) wet bulb. The discharge pressure should read (at a gage in the discharge charging valve) 285 psig (± 5 psig) and the suction pressure should read (at a gage in the suction charging valve) 68 psig (± 2 psig). The windings of the compressor motor should be checked with an ohmmeter with the reading to be 0.387 ohms at 25°C with 7 percent tolerance. (A to B, B to C, C to A)

b. Disassembly, (fig. 7-12).

(1) Unsolder the precooler coil (8) at both ends and remove the coil from the compressor (1).

(2) Unsolder the filter (9) from the compressor and tubing (10) and remove the filter.

c. Cleaning, Inspection, Replacement.

(1) Plug the compressor tubing ends. Clean scale and corrosion from the precooler, compressor and filter with a stiff bristle brush or soft wire brush.

(2) Any paint removed from the compressor should be retouched or the whole compressor repainted.

(3) Use a cloth dampened in a dry cleaning solvent, Federal Specification P-S-661, and wipe the compressor, coil and filter.

(4) Use a dry compressed air and blow out the inside of the precooler.

(5) Inspect the precooler for dents, cracks or other damage. Replace if damaged.

(6) Inspect the filter for dents, or cracks and for contamination. Replace a damaged or restricted filter.

d. Reassembly. Reassembly shall be in reverse order of disassembly. Make sure all soldered joints are secure and free of leaks.

7-18. Compressor-Motor Burnout Clean Up Procedure

a. General.

(1) The scope of this procedure pertains to hermetic compressors.

(2) Experience has demonstrated that after a hermetic motor burnout the system must be cleaned thoroughly to remove all contaminants; otherwise a repeat burnout will occur. Failure to follow these instructions as quickly as possible will result in an excessive risk of a repeat burnout and damage to other system components.

b. Clean Up Procedure.

Make certain that a burnout has occurred. A motor that fails to start may be due to improper voltage or a malfunction of the compressor start relay, or a compressor mechanical fault.

(1) To check for proper voltage, turn off the main disconnect switch so that all power is off.

(2) Remove the front access cover.

(3) Remove the compressor leads at the compressor side of the compressor start relay.

(4) Close the disconnect switch to energize the control circuit.

(5) Check for voltage on all lines at both the line and load side of the compressor start relay.

Note. Before checking the compressor motor, make sure the compressor is cool to the touch. Otherwise a false indication may be obtained due to internal motor protectors being open.

(6) Check the compressor motor to see if it is electrically grounded or open. A 500-volt megger or an ohmmeter can be used for making the test. Typical megger readings are 5 megohms for R-22. If no fault is found and if the normal values for winding resistance are known, check and record stator currents for balance by the wattmeter or ohmmeter method. Use rated meters.

Note. A slight unbalance in stator currents may occur. An appreciable unbalanced phase indicates a shorted winding. Resistance should be checked with a precision ohmmeter to determine if turn-to-turn shorts exist.

(7) Purge a small quantity of refrigerant gas from the compressor and smell it cautiously.

A motor burnout is usually indicated by the customary burned odor.

c. Safety Measures. In addition to the electrical hazards, the serviceman should be aware of acid burns.

(1) When testing for odor, release a small amount of gas and smell it cautiously to avoid inhalation of toxic decomposition products.

(2) When discharging gas or liquid refrigerant from a burnout, avoid eye or skin contact with the product. If the entire charge is to be removed, it should be discharged outside any enclosure. Do not discharge in the vicinity of open flame.

(3) When necessary to come in contact with oil or sludge from a burned out compressor, approved rubber gloves should be worn to avoid acid burns.

d. Determine Severity of Burnout. It is helpful to classify burnouts as "mild" or "severe" and to use the severity as a guide for the clean-up procedure to be followed. The severity can be determined by the following means:

(1) If possible, obtain a small sample of oil from the burned out compressor and analyze it, using an acid test kit. Excessive acidity (over 0.05 acid number) in the oil indicates a severe burnout. This is the best method of determining the severity of burnout. Discoloration of the oil may also indicate a severe burnout.

(2) If none of the above indications of severe contamination are found, then the burnout can be classified as mild.

e. Clean-up After a Mild Burnout. When the burnout is mild, the contaminant can be removed by changing the liquid line dehydrator, or installing one if the system did not have one originally. The procedure to follow is:

(1) Discharge the refrigerant system (para 7-4b).

(2) Remove the burned out compressor and install the replacement (para 6-13).

(3) Remove the dehydrator and install an oversize replacement dehydrator.

(4) Evacuate the system (para 7-4c).

(5) Recharge the system and put in operation (para 7-4e).

f. Clean-up After a Severe Burnout. Complete cleaning of the system is required.

(1) Discharge the refrigerant system (para 7-4b).

(2) Install a dehydrator in the suction line, change strainer, as well as changing or installing an oversize liquid line dehydrator. In this way the suction dehydrator protects the new compressor from any contaminants that may remain in the system. Leaving a permanent type dehydrator in the suction line allows the serviceman to complete the clean-up at one time. A pressure tap should be installed upstream of the suction dehydrator so that the pressure drop from the tap to the service valve can be checked after several hours of operation. A pressure drop in excess of 3 psi is generally considered excessive.

(3) Check the expansion device and clean or replace it. Replace sight glass (para 7-23).

(4) Remove the burned out compressor and install the replacement.

(5) Evacuate the system.

(6) Recharge the system and put in operation.

(7) Check pressure drop across suction dehydrator after one hour operation. Change if necessary and evacuate system (para 7-4c).

(8) After 8 to 24 hours operation, change suction dehydrator, check odor and color of oil or test with test kit. Evacuate system (para 7-4c).

(9) After 14 days of operation, check color and acidity of oil. If required, change dehydrators. Before clean-up is completed, it is essential that oil is clean and no acid is present.

Note. The new compressor should not be used for pulling a vacuum. Pull a high vacuum (less than 500 microns) for several hours. Allow the system to stand several hours to be sure the vacuum is maintained.

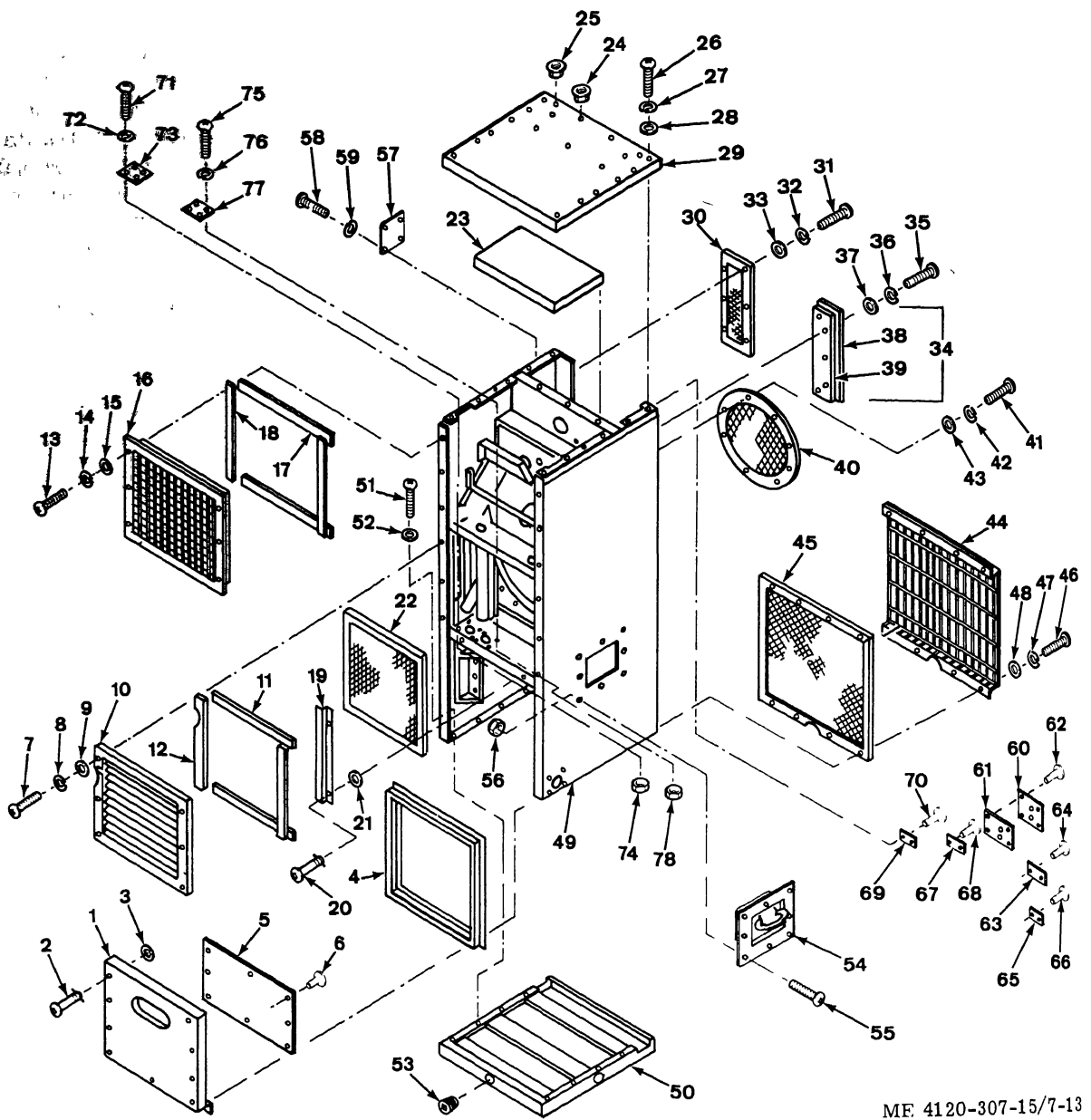
7-19. Casing Assembly

a. General. The casing assembly is an integral unit except for removal panels, grilles and insulation. These items may be replaced if damaged.

b. Disassembly, (fig. 7-13).

(1) Remove any panels or grilles attached with screws. Do not attempt to disassemble or separate panels or frames that are secured with rivets.

(2) If a case assembly is to be discharged be sure that all components are removed. Procedures



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Figure 7-13. Casing assembly, exploded view.

1 Panel, lower front	27 Washer	53 Plug, pipe
2 Screw	28 Washer	54 Handle
3 Washer	29 Top	55 Screw
4 Strip, rubber	30 Screen, fresh air	56 Nut, self-locking
5 Plate, wiring diagram	31 Screw	57 Cover, 1.75 SQ
6 Rivet	32 Washer	58 Screw
7 Screw	33 Washer	59 Washer, lock-spring
8 Washer	34 Cover assembly	60 Plate, instruction
9 Washer	35 Screw	61 Gasket
10 Grille, intake	36 Washer	62 Rivet
11 Strip, gasket	37 Washer	63 Plate, information
12 Strip, gasket	38 Cover	64 Rivet
13 Screw	39 Gasket	65 Plate, fan rotation indicating
14 Washer	40 Guard, condenser fan	66 Rivet
15 Washer	41 Screw	67 Plate, moisture indicator
16 Grille, discharge	42 Washer	68 Rivet
17 Strip, gasket	43 Washer	69 Plate, instruction
18 Strip, gasket	44 Guard, condenser coil	70 Rivet
19 Screw	45 Filter, condenser coil	71 Screw
20 Stud, retainer	46 Screw	72 Washer, lock-spring
21 Washer, flat	47 Washer	73 Cover, 1.75 SQ
22 Filter, air conditioner	48 Washer	74 Nut
23 Insulation	49 Casing	75 Screw
24 Nut	50 Panel, bottom	76 Washer, lock-spring
25 Nut	51 Screw, cap	77 Cover, 1.88 SQ
26 Screw	52 Washer	78 Nut

Figure 7.13. Casing assembly, exploded view—Continued

for removing all items are contained in Chapters 3, 6 and 7 of this manual.

c. Cleaning.

(1) Remove scales, loose paint and corrosion with a wire brush.

(2) Blow loose dirt from seams and corners with compressed air.

(3) Use a light air blast to blow dust and dirt from the insulation.

(4) Using a cloth dampened in a dry cleaning solvent, Federal Specification P-S-661, wipe both the inside and outside of the casing, grilles and panels.

d. Inspection.

(1) Inspect the casing for loose rivets, weldments, dents, cracks and damaged finish.

(2) Inspect the panels and grilles for dents, missing finish or other damage.

e. Repair, Replacement.

(1) Small dents in the casing or panels may be straightened. Loose rivets should be tightened and broken welds should be rewelded.

(2) If the casing, panels or grilles are excessively damaged, then they must be replaced.

(3) Any finish missing from the casing, panels or grilles must be retouched or the whole casing assembly refinished.

(4) Replace wet, dirty or damaged insulation.

f. Reassembly. Reassemble the casing in reverse order of disassembly.

7-20. Charging Valves

a. Removal, (fig. 7-14).

(1) Drain the refrigerant system (para 7-4b.)

(2) Remove five screws (1) and remove the fresh air inlet screen (2).

(3) Remove screw (4), nut and washer (5) holding the charging valve clamp (6) and remove the clamp.

(4) Remove the tubing from the charging valve to be removed.

(5) Remove the charging valve (7) from the air conditioner.

Note. Valve cores may be replaced if defective.

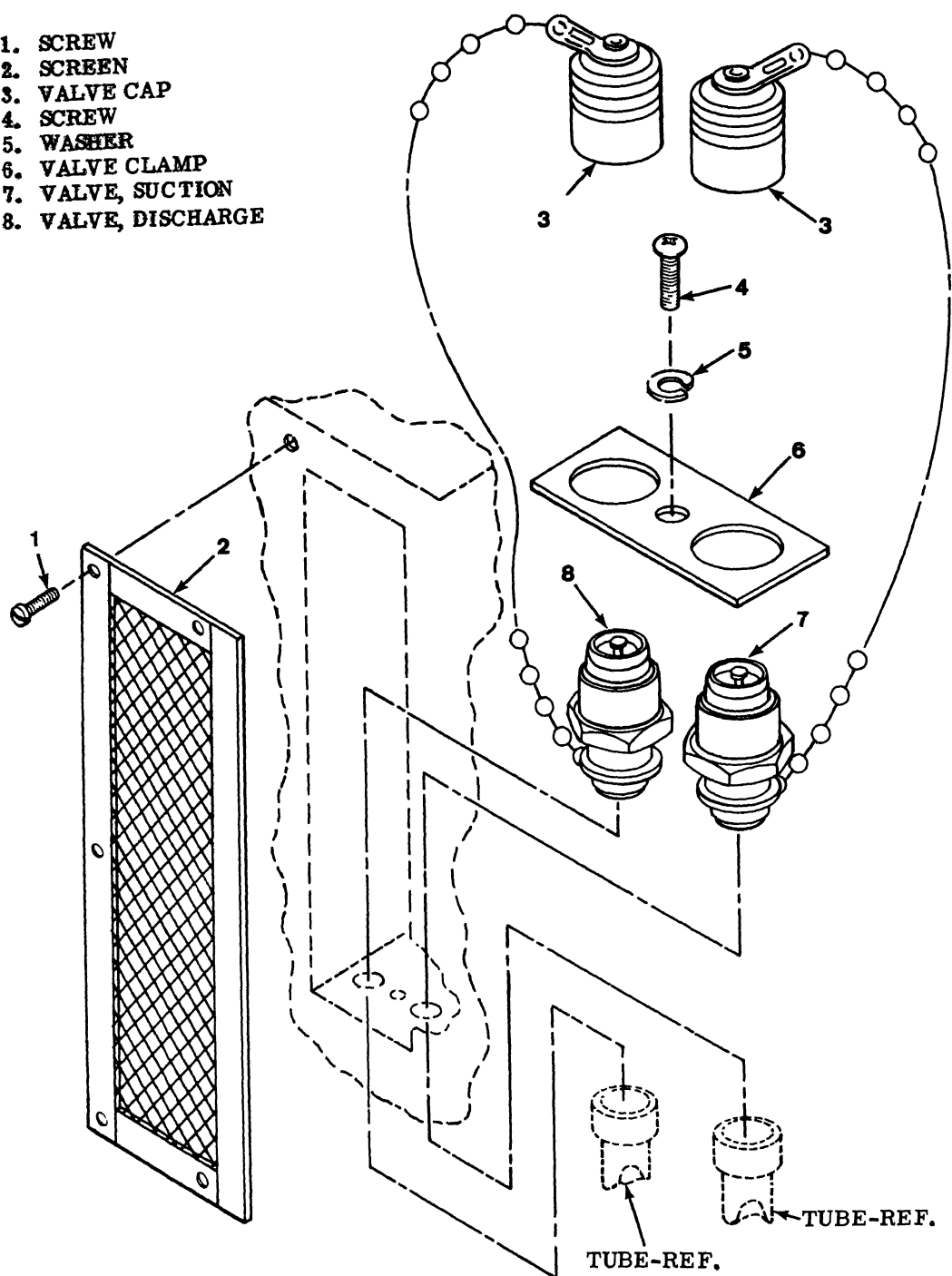
b. Installation, (fig. 7-14). Installation of the charging valves shall be in reverse order of removal. Be sure that all soldered connections are tight. Service the system as required in paragraph 7-4.

Warning: Refrigerant system must be discharged before disconnecting any components. Refer to paragraph 7-4.

7-21. Dehydrator

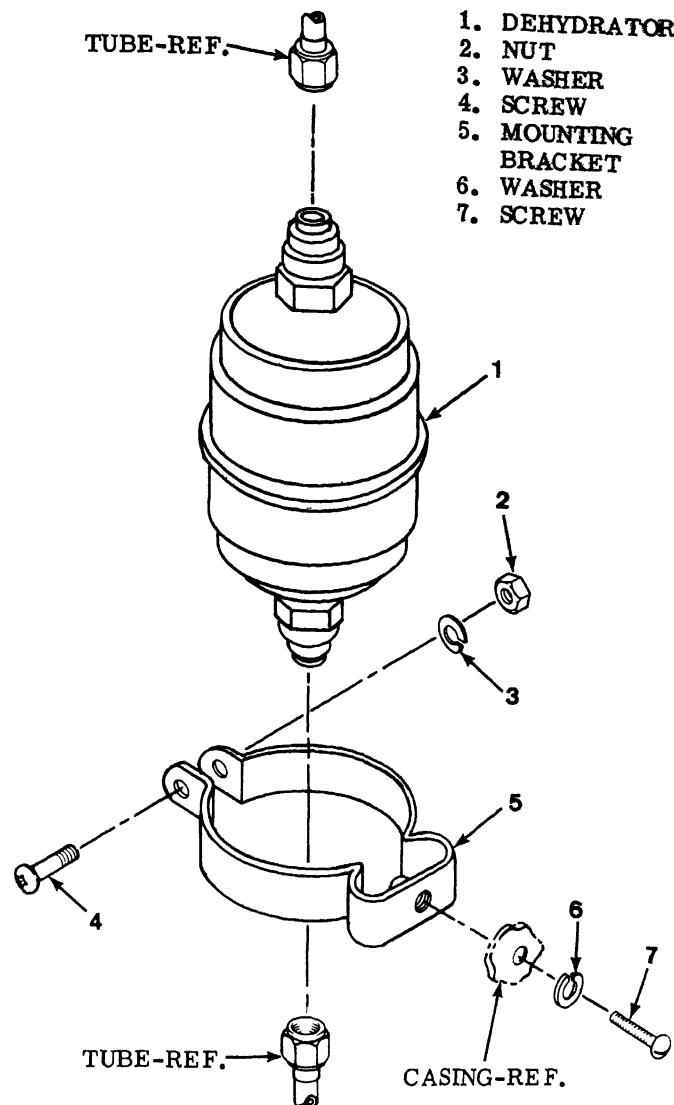
The dehydrator is a filter and moisture drier for the refrigerant system. When the sight glass indicates that moisture is present in the system, (yellow color), or whenever the system is opened for repair, the dehydrator is to be replaced. Insure that the dehydrator is installed with the

1. SCREW
2. SCREEN
3. VALVE CAP
4. SCREW
5. WASHER
6. VALVE CLAMP
7. VALVE, SUCTION
8. VALVE, DISCHARGE



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Figure 7-14. Refrigerant charging valves, removal and installation.



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Figure 7-15. Dehydrator, removal and installation.

outlet toward the sight glass. The dehydrator is marked with an arrow showing the direction of flow.

a. Removal, (fig. 7-15).

(1) Remove two screws and remove the front access panel.

(2) Remove junction box assembly (para 6-12).

(3) Remove flare nuts from each end of the dehydrator (1).

(4) Remove screw (7) and lockwasher (6) from outside of air conditioner case and remove the dehydrator with mounting bracket.

(5) Remove screw (4), lockwasher (3) and nut (2). Then remove the mounting bracket (5) from the dehydrator.

b. Installation, (fig. 7-15). Installation of the dehydrator shall be in reverse order of removal. Always install a new dehydrator when the system has been opened to the atmosphere.

7-22. Sight Glass

The sight glass provides a means of determining the moisture content of the refrigerant system. If the color green is showing in the sight glass it indicates the refrigerant is dry. A chartreuse

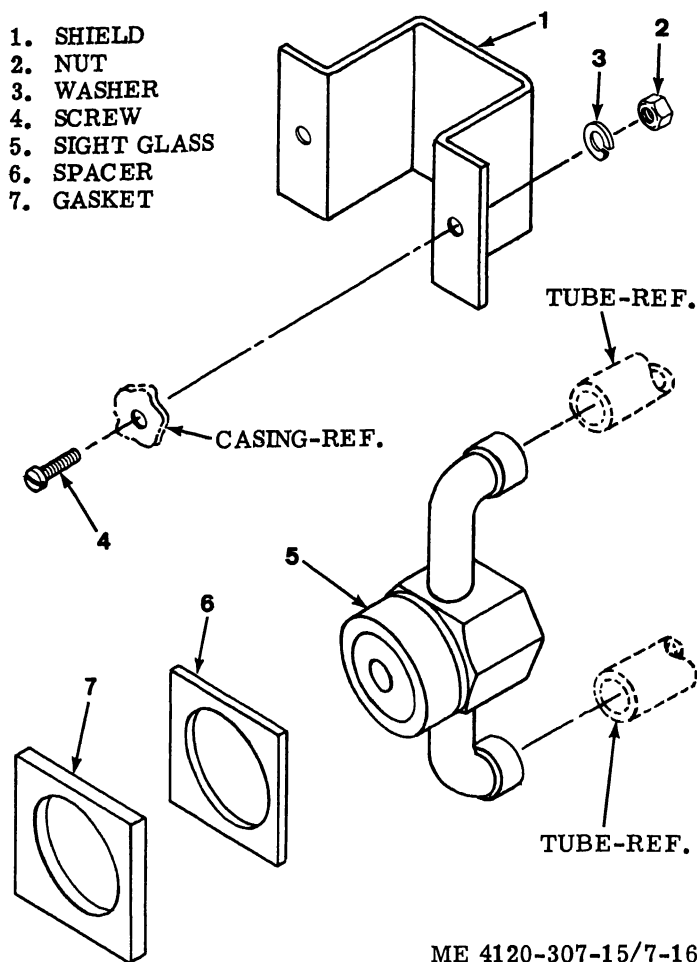


Figure 7-16. Sight glass, removal and installation.

color indicates that some moisture is present in the system and that caution should be observed about replacing the dehydrator. A definite yellow color indicates excess moisture in the system and that the dehydrator must be replaced. It also indicates a low refrigerant charge. It should be checked for this condition during the cooling cycle only.

a. Removal, (fig. 7-16).

(1) Remove twenty screws securing the air conditioner top panel and remove the top panel.

(2) Unsolder the sight glass refrigerant line connections.

(3) Remove two screws (4), nut (2) and washers (3) securing the sight glass (5) to the air conditioner rear panel and remove the sight glass (5), spacer (6) and gasket (7).

b. Installation, (fig. 7-16). Installation of the sight glass shall be the opposite of removal.

Recharge the system as described in Chapter 7 of this manual.

Warning: Refrigerant system must be discharged before disconnection of any components. Refer to paragraph 7-4.

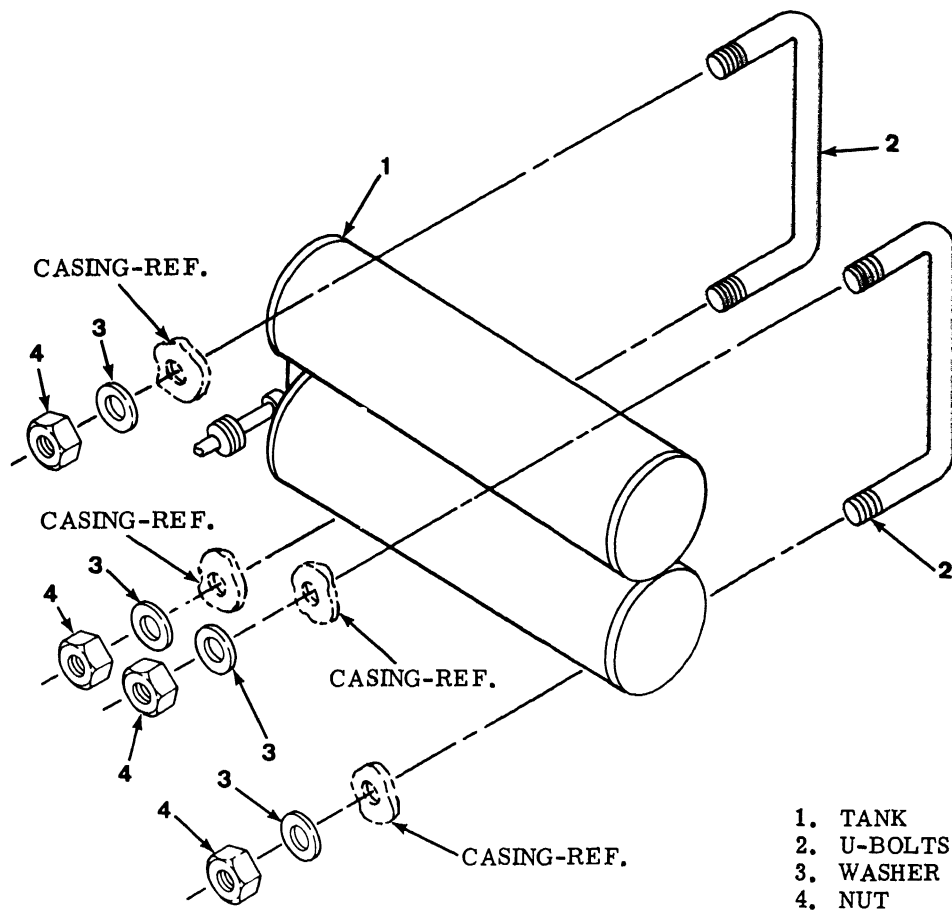
7-23. Tank

The refrigerant tank serves as a device to maintain sufficient discharge pressure in the refrigerant system during low ambient operation.

a. Removal, (fig. 7-17).

(1) Remove twenty screws securing the top panel on the air conditioner and remove the top panel.

(2) Refer to paragraph 6-16 and remove the expansion valve located over the tank. Remove the tubing over the tank then remove the expansion valve mounting bracket.



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Figure 7-17. Tank, removal and installation.

(3) Disconnect the three phase heater wiring harness at the connector and move it out of the way.

(4) Unsolder the refrigerant line and free the line from the end of the tank assembly.

(6) Remove four nuts (4) and lockwashers (3) from the two U bolts (2) holding the tank (1) and remove the U bolts and the tank.

b. *Installation, (fig. 7-17).* Installation of the tank shall be the reverse order of removal. Recharge the system as described in Chapter 7 of this manual.

7-24. Fluid Pressure Regulator

The pressure regulating valve is incorporated in the refrigerant system to regulate pressure on the suction side of the system and maintain it at a constant 58 psig at all times the air conditioner

is operating. To check the valve, install a gage in the suction charging valve; increase the thermostat setting until the liquid line solenoid valve closes. This will lower the suction pressure. Then adjust the pressure regulator to compensate for the suction pressure drop. Turning the pressure regulator adjustment clockwise will increase the pressure and turning it counterclockwise will decrease the pressure.

a. Removal, (fig. 7-18).

(1) Remove twenty screws securing the top panel on the air conditioner and remove the top panel.

(2) Unsolder the refrigerant line from the fluid pressure regulator.

(3) Remove mounting clamp and screws.

(4) Remove the regulator (1) from the system.

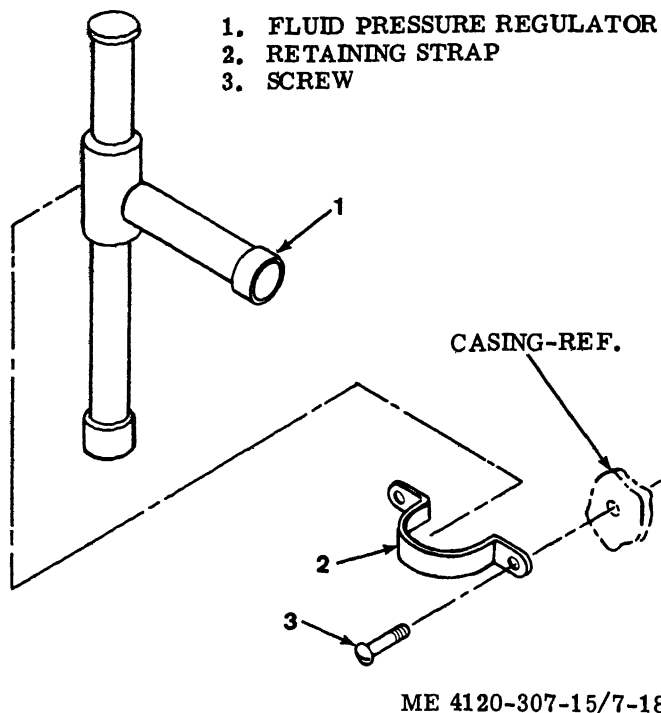


Figure 7-18. Fluid pressure regulator, removal and installation.

b. *Installation, (fig. 7-18).* Installation of the fluid pressure regulator shall be the reverse of removal. If a new regulator has been installed it may require adjustment according to instructions provided in Chapter 7.

7-25. Pressure Relief Valve

The pressure relief valve is a safety device used to relieve refrigerant pressure if it attempts to go higher than the system is designed to withstand. The only way to check the valve for proper operation is to remove it from the system and use either compressed air or nitrogen to check at what pressure it relieves. Proper relief pressure is 540 psig.

a. Removal, (fig. 7-19).

(1) Remove two screws securing the lower front panel and remove the front panel.

(2) Remove junction box assembly (para 3-46).

(3) Discharge the refrigerant and unscrew the relief valve (1) from the system fitting (4).

b. *Installation, (fig. 7-19).* Installation shall be the reverse order of removal. Be sure relief valve fitting is tight.

7-26. Check Valve

The purpose of the check valve is to prevent liquid refrigerant from draining from the head pressure control tank into the condenser coil. This is a normally open valve. To test valve operation, operate the air conditioner at a low ambient temperature. This will cause a low head pressure which in turn will cause the valve to close. If the unit is operated for this test condition and no cooling occurs, it indicates a faulty valve that will not close.

a. Removal, (fig. 7-20).

(1) Remove two screws securing the lower front panel and remove the panel.

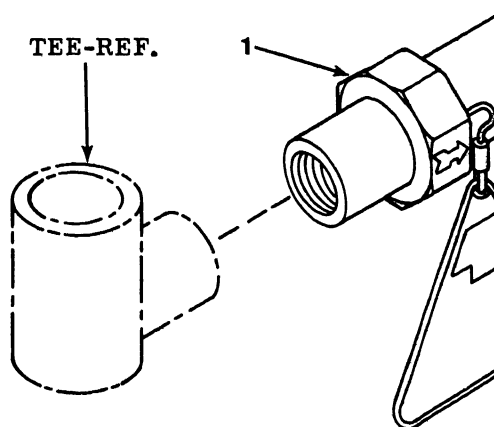
(2) Remove junction box assembly (para 3-46).

(3) Discharge the refrigerant and unsolder the check valve (1) from the refrigerant system.

b. *Installation, (fig. 7-20).* Installation of the check valve shall be the reverse order of removal. Be sure solder connections are tight.

7-27. Pressure Switch S3

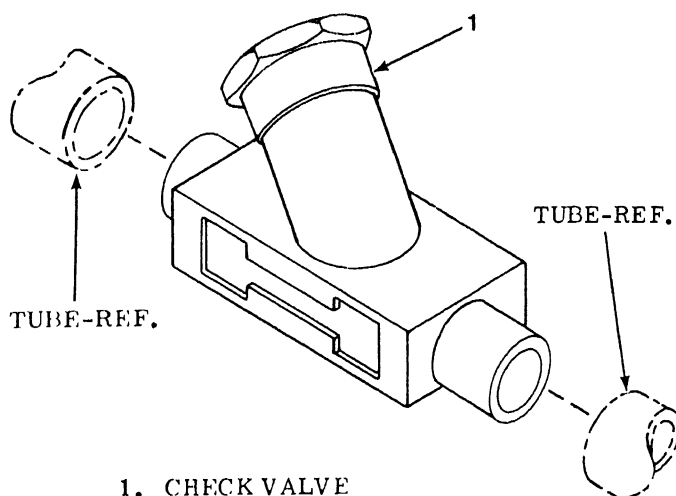
The S3 pressure switch is designed to help protect the air conditioner and it operates in conjunction



1. PRESSURE RELIEF VALVE

ME 4120-307-15/7-19

Figure 7-19. Pressure relief valve, removal and installation.



1. CHECK VALVE

ME 4120-307-15/7-20

Figure 7-20. Check valve, removal and installation.

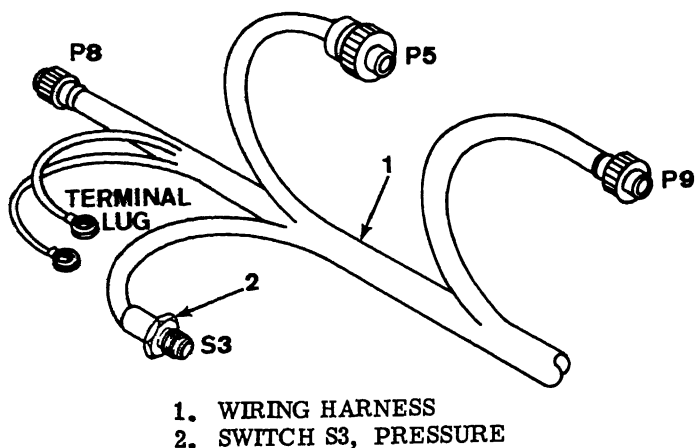
th the fan motor. If the fan motor speed switch set on low speed and the discharge pressure on the compressor reaches or exceeds 350 psig, will override the toggle switch and send the motor to high speed. To check proper operation of the switch, block the condenser coil, place gage in the discharge charging valve and see if the switch actuates when pressure reads

350 psig. Remove block and see that fan returns to low speed when pressure drops to 300 psig.

a. Removal, (fig. 7-21).

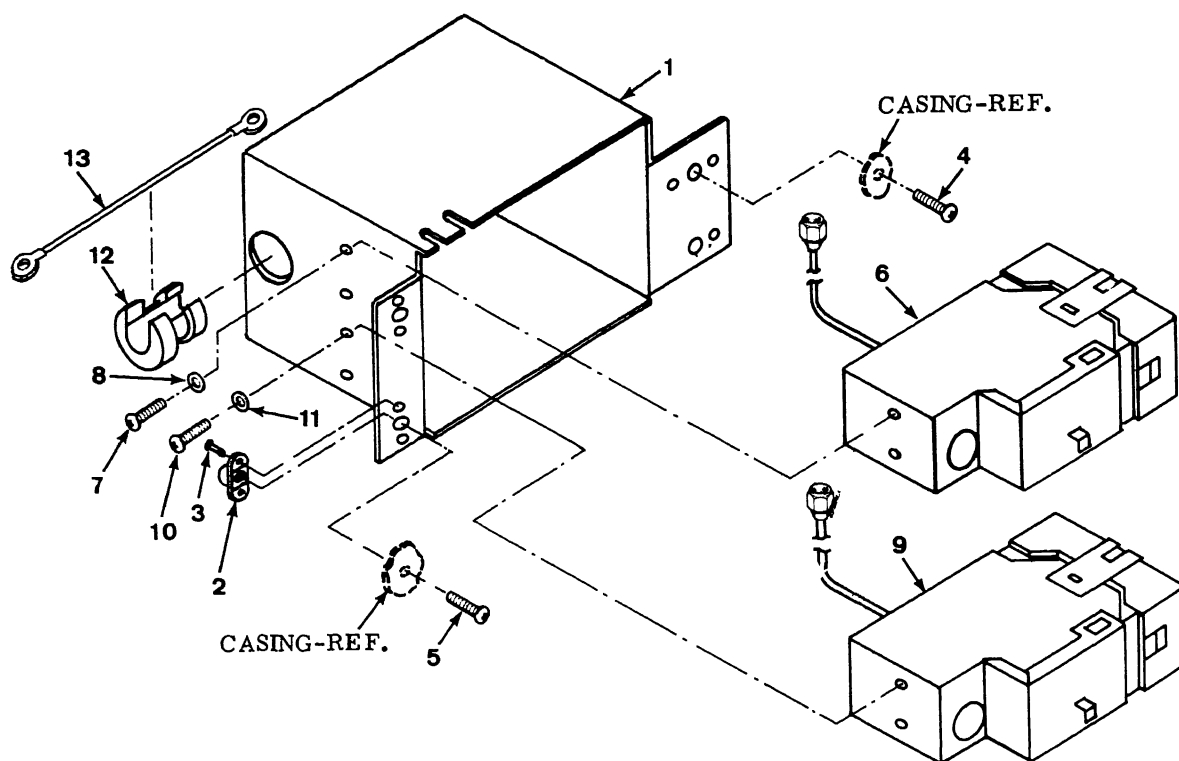
(1) Remove two screws securing the lower front panel and remove the panel.

(2) Remove junction box assembly (para 3-46).



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Figure 7-21. Pressure switch S3, removal and installation.



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Figure 7-22. Pressure switches S6 and S7, removal and installation.

(3) Discharge the refrigerant and unscrew the pressure switch (2) from the refrigerant system.

b. *Installation, (fig. 7-21).* Installation of the pressure switch shall be the reverse order of removal.

7-28. Pressure Switches S6 and S7

The pressure switches S6 and S7 are protective devices that are incorporated into the refrigerant system. S6 is a high discharge pressure switch that stops the compressor if the discharge pressure gets too high. S7 is the low suction pressure switch that will stop the compressor if suction pressure drops too low. To check the S6, high pressure switch, block the condenser coil, use a gage in the discharge charging valve and when pressure reads 445 (± 5) psig switch should actuate and stop compressor. Press button on switch to reset it. The low pressure switch, S7, must be removed from the system to be checked. Use either compressed air or nitrogen for testing. The switch should operate when pressure drops to 7 (± 5) psig. This switch requires manual setting.

a. *General.* Pressure switches S6 and S7 are contained in an enclosure behind the rear panel and toward the top. The pressure switches and

enc
the
t

p

3

outside
switch enclosure assem
being careful not to da
on each pressure switch.

(7) Remove two screws (10) holding each pressure switch to the enclosure and remove the switches (6 and 9).

c. *Installation, (fig. 7-22).* Installation of the pressure switches shall be the reverse of removal. Care must be taken so as not to damage the capillary tubing of each switch and that each one is connected properly.

Section IV. ADJUSTMENT PROCEDURES

7-29. General

This section provides adjustment instructions for adjusting the thermostatic expansion valves, fluid pressure regulator and pressure switches S6 and S7. Each component must be installed on the air conditioner for accurate adjustment.

7-30. Thermostatic Expansion Valves

a. *General.* Two thermostatic expansion valves are used in the air conditioner. One expansion valve controls the rate of flow of liquid refrigerant into the evaporator coil during the cooling cycle of operation. The second expansion valve functions when the unit is in the bypass cycle of operation. Each valve is equipped with a super heat setting or adjustment 6°F (3.33°C) for the main valve and 25°F (12.78°C) for the bypass valve to assume efficiency in the refrigerant system. The adjustment procedures may be applied to either or both expansion valves. Adjust only when absolutely necessary and then only during the cooling cycle.

b. *Adjustment, (fig. 7-23).*

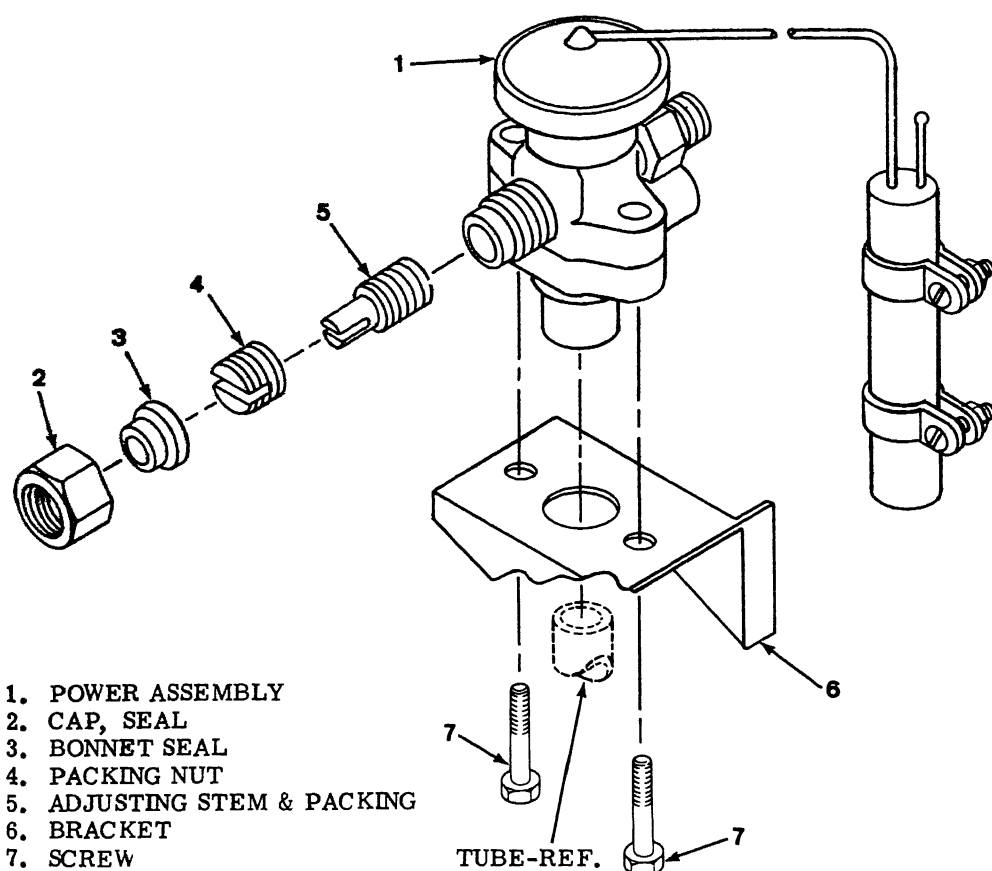
(1) Tape the bulb of a thermometer to the suction tube near the sensing element. Insulate the thermometer bulb.

(2) Install a suitable pressure gage at suction tube charging valve.

(3) Operate the unit for approximately 30 minutes or until thermometer reading stabilizes.

(4) Check thermometer and pressure gage readings. Compare readings with figure 7-24. Thermometer reading should be approximately 6°F (3.33°C) for cooling cycle or 25°F (12.78°C) for bypass cycle higher than the temperature given on the chart.

(5) Remove cap (2) from side of valve. If temperature reading is high, turn adjusting screw (5) counterclockwise approximately one turn for each 4°F (2.24°C) that temperature is high. If temperature reading is low turn adjusting screw clockwise approximately one turn for



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Figure 7-28. Thermostatic expansion valve adjustment.

1 4°F (2.24°C) that temperature is low. Install cap on side of valve when adjustment is completed. Remove gage and thermometer.

11. Fluid Pressure Regulator

General. The fluid pressure regulating valve regulates refrigerant pressure in the evaporator to prevent coil freeze up. The valve is set to establish a minimum pressure in the evaporator of 8 psig.

Adjustment, (fig. 7-25).

(1) Remove twenty screws securing the top panel and remove the panel to gain access to the pressure regulator. Install pressure gage.

(2) Remove cap and use a screwdriver to turn the adjusting screw and turn clockwise to increase pressure or counterclockwise to decrease pressure. This valve is to be adjusted only when absolutely necessary and then only when operating on the by-pass cycle.

(3) Replace cap and tighten the locknut and recheck the pressure reading. Remove pressure gage.

7-32. Pressure Switches S6 and S7

a. General. Two pressure switches are used as safety devices on the air conditioner to turn the refrigeration system off if pressure drops below (S7) a preset point or goes above (S6) a preset point. The adjustment on these switches should not be tampered with unless it is positively established that adjustment is required.

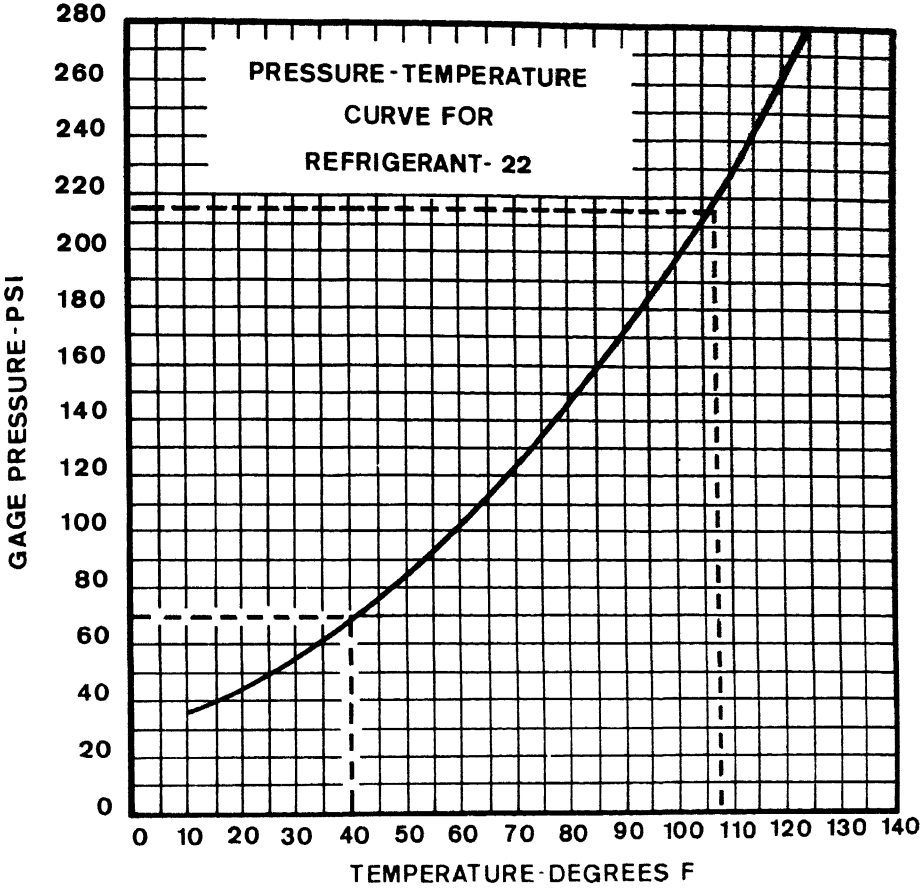
b. Adjustment.

(1) Install pressure gages. A knurled knob on each pressure switch provides the means of adjustment of the switches.

(2) Low pressure cutout switch (S7) should be set for 7 ± 5 psig.

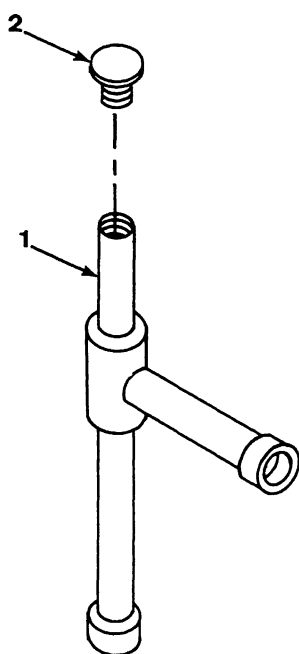
(3) High pressure cutout switch (S6) should be set for $445 \pm$ psig.

(4) Remove pressure gages.



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Figure 7-24. Refrigerant-22 pressure-temperature chart.



1. VALVE, PRESSURE REGULATING
2. SCREW, CAP

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Figure 7-25. Fluid pressure regulator adjustment.

APPENDIX A

REFERENCES

A-1. Fire Protection

TB 5-4200-200-10

Hand Portable Fire Extinguishers for Army Users

A-2. Lubrication

C9100IL

Fuels, Lubricants, Oils and Waxes

A-3. Painting

TM 9-213

Painting Instructions for Field Use

A-4. Radio Suppression

TM 11-483

Radio Interference Suppression

A-5. Maintenance

TM 38-750

TM 5-764

Army Equipment Record Procedures
Electric Motor and Generator Repair

A-6. Shipment and Storage

TB 740-93-2

TM 740-90-1

Preservation of USAMEC Mechanical Equipment for Shipment
and Storage
Administrative Storage of Equipment

APPENDIX B

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists items which accompany the air conditioner or are required for installation, operation, or operator's maintenance.

B-2. General

This Basic Issue Items List is divided into the following sections:

a. *Basic Issue Items—Section II.* A list of items which accompany the air conditioner and are required by the operator/crew for installation, operation, or maintenance.

b. *Maintenance and Operating Supplies—Section III.* A listing of maintenance and operating supplies required for initial operation (not applicable).

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. *Source, Maintenance, and Recoverability Codes (SMR).*

(1) Source code indicates the source for the listed item. Source codes are:

Code	Explanation
P	Repair parts which are stocked in or supplies from the GSA/DSA, or Army supply system and authorized for use at indicated maintenance categories.
P2	Repair parts which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.
M	Repair parts which are not procured or stocked, but are to be manufactured in indicated maintenance levels.
A	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.
X	Parts and assemblies which are not procured or stocked and the mortality of which normally is below that of the applicable end item or component. The failure of such part or assembly should result in retirement of the end item from the supply system.

Code

Explanation

X1	Repair parts which are not procured or stocked. The requirement for such items will be filled by use of the next higher assembly or component.
X2	Repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization. Where such repair parts are not obtainable through cannibalization, requirements will be requisitioned, with accompanying justification, through normal supply channels.
G	Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above GS and DS level or returned to depot supply level.

(2) Maintenance code indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	Operator/crew

(3) Recoverability code indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Repair parts (assemblies and components) which are considered economically repairable at direct and general support maintenance levels. When the maintenance capability to repair these items does not exist, they are normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.
S	Repair parts and assemblies which are economically repairable at DSU and GSU activities and which normally are furnished by supply on an exchange basis. When items are determined by a GSU to be uneconomically repairable they will be evacuated to a depot for evaluation and analysis before final disposition.

Explanation

High dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts normally are repaired or overhauled at depot maintenance activities.

Repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, or high dollar value reusable casings or castings.

Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

Description. This column indicates the Federal item name and any additional description of the item required. The abbreviation "w/e", when used as a part of the nomenclature, indicates the Federal stock number, includes all armament, accessories, and repair parts issued with the item. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses. Repair parts quantities included in kits, and assemblies are shown in front of the item part name.

Unit of Measure (U/M). A two-character alphabetic abbreviation indicating the amount or

quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Incorporated in Unit. This column indicates the quantity of the item used in the assembly group. A "V" appearing in this column in lieu of a quantity indicates that a definite quantity cannot be indicated (e.g. shims, spacers, etc.)

f. Quantity Furnished With Equipment. This column indicates the quantity of an item furnished with the equipment.

g. Illustration. This column is divided as follows:

(1) **Figure number.** Indicates the figure number of the illustration in which the item is shown.

(2) **Item number.** Indicates the callout number used to reference the item in the illustration.

B-4. Federal Supply Code for Manufacturers

Code	Manufacturer
94833	Keco Industries, Inc.
96906	Military Standards
97403	Army Engineer Research and Development Laboratories

Section II. BASIC ISSUE ITEMS

(2) Federal stock number	(3) Description Ref No. & Mfr Code	(4) Unit of meas	(5) Qty Inc in unit	(6) Qty furn with equip	(7) Illustration	
					(A) Fig No.	(B) Item No.
7520-559-9618	MANUFACTURER OR DEPOT INSTALLED					
	CASE: maintenance and operational manuals, Department of the Army Manual TM 5-4120-307-15	ea	1	1		
	TROOP INSTALLED OR AUTHORIZED BLOCK OFF PANEL (94833) 13211E8393	ea		1		
	RECEPTACLE, ELECTRICAL (96909) MS3106R22-22-S(C)	ea	1	1		
	SOUND ATTENUATOR (97403) 13211E3798	ea	1			

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I INTRODUCTION

C-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II (not applicable).

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

C-2. Explanation of Columns in Section II

a. *Group Number, Column (1).* The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1, Functional Grouping Codes) are listed in the MAC in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. *Functional Group, Column (2).* This column contains a brief description of the components of each functional group.

c. *Maintenance Functions, Column (3).* This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

- C—Operator or crew
- O—Organizational maintenance
- F—Direct support maintenance
- H—General support maintenance
- D—Depot maintenance

The maintenance functions are defined as follows:

A—Inspect: To determine serviceability of an item by comparing its physical, mechanical, and

electrical characteristics with established standards.

B—Test: To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C—Service: To clean, to preserve, to charge, to paint, and to add fuel, lubricants, cooling agents, and air.

D—Adjust: To rectify to the extent necessary to bring into proper operating range.

E—Align: To adjust specified variable elements of an item to bring to optimum performance.

F—Calibrate: To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G—Install: To set up for use in an operational environment such as an emplacement, site, or vehicle.

H—Replace: To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

I—Repair: To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.

J—Overhaul: To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards using the Inspect and Repair Only as Necessary (IROAN) technique.

K—Rebuild: To restore an item to a standard as nearly as possible to original or new condition in appearance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

d. *Tools and Equipment, Column (4).* This column is provided for referencing by code the special tools and test equipment, (sec III) required to perform the maintenance functions (sec II).

e. *Remarks, Column (5).* This column is provided for referencing by code the remarks (sec II) pertinent to the maintenance functions.

C-3. Explanation of Columns in Section IV

a. *Reference Code.* This column consists of two letters separated by a dash, both of which are references to Section II. The first letter reference column 3, A through K.

b. *Remarks.* This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
1501	FRAME Frame assembly Base assembly ----- Casing assembly ----- Guard, condenser fan ----- Screen, drain, base -----								H					
	BODY, CAB, HOOD AND HULL													
1801	Panels Baffle ----- Chain & damper control ----- Cover assemblies ----- Damper assembly ----- Grilles ----- Panel assembly, front lower ----- Panels, back & top ----- Retainer assembly, filter ----- Sound attenuator & paulin -----	O							H					
	BODY, CHASSIS OR HULL AND ACCESSORY ITEMS													
2202	Accessory items Connection assembly, remote control -----	O						O	O					
2207	Winterization equipment Heater, electrical -----	O	O						O					
1000	ELECTRIC MOTORS Motor assembly ----- Mount bushing ----- Motor assembly, fan ----- Bearing -----	C	O	C					O	F				
1001	Rotor assemblies Rotor, fan motor -----	F							F					
1002	Stator assemblies Stator, fan motor -----	F	F						F					
1005	Frame, supports & housings Cover, stator housing ----- Endbell, housing ----- Housing, stator -----	F							F					

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
4906	Starting & protective devices													
	Protector overload		O						O					
	Relay, phase		O						O					
4909	Control panels, housing cubicles													
	Box, control		O						O					
	Connector, receptacle		O						O					
	Control panel assembly		O						O	O				
	Leads, electrical		O						O					
	Receptacle		O						O					
4010	Master or auxiliary control assembly													
	Contact, electrical		O						O					
4011	Circuit breakers													
	Circuit breakers, compressor		O						O					
	Fuse		O						O					
4012	Switches													
	Switch, rotary		O						O					
	Switch, pressure													
	Hi & Lo		F						F					
	Switch, thermostatic		O						O					
	Switch, fan speed		O						O					
	Switch, pressure, fan speed		F						F					
4017	Transformer: Rectifier													
	Rectifier		O						O					
	Transformer		O						O					
4018	Terminal blocks													
	Connector, receptacle		O						O					
	Terminal blocks		O						O					
4214	Radio interference suppression filter, RFI		O						O					
47	GAGES													
4702	Gages													
	Sight glass	O							H					
52	REFRIGERATION & AIR CONDITIONING COMPONENTS													
5200	Gas compressor													
	assembly		F	F					H					A
	Compressor assembly	F	F	F					H					
	Mount, resilient	O							H					
5217	Refrigerant piping													
	Valve, check		F						F					
	Tubing, cooper		F						F					
	Valve, pressure relief		F						F					
	Valve, regulating		F		F				F					
	Valve, service		F						F	F				B
	Valve, solenoid		F						F					
	Tank, surge								F					
	Valve, thermostatic bypass				F				F					

	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
10	Condenser								F					
	Subcooler -----	--	--	--	--	--	--	--	F					
	Condenser assembly ----	--	F	C	--	--	--	--	F					
	Receiver -----	--	--	--	--	--	--	--	F					C
15	Hydrating equipment													
	Dehydrator -----	--	--	--	--	--	--	--	F					
11	Evaporator													
	Evaporator assembly ----	--	F	C	--	--	--	--	F	--	--	--		D
	Tube, drain -----	--	O	--	F	--	--	--	F					
	Valve, expansion -----	--	F	--	F	--	--	--	F					
13	Fan assembly													
	Fan -----	O	--	--	--	--	--	--	O					
14	Thermostatic controls													
	Switch, thermostat													
	temperature													
	regulating -----	O	--	--	--	--	--	--	O					
15	Air filters													
	Filters -----	C	--	C	--	--	--	--	C					

Section IV. REMARKS

Reference Code	Remarks
A-B	Testing includes the use of the Halide Torch Leak Detector, or a soap solution to detect leaks, and proper operating pressure test. (D/S level only.)
A-C	Service includes check of oil level and add oil using clear, fresh and dry oil of FSN 9150-823-7905, and adding refrigerant. (D/S level only.)
B-C	Clean with approved dry cleaning solvent, Federal Specification P-S-661, dry thoroughly.
B-I	Repair of solenoid valves limited to replacement of coil only.
C-C	Clean with approved dry cleaning solvent, Federal Specification P-S-661, dry thoroughly.
D-C	Clean with approved dry cleaning solvent, Federal Specification P-S-661, dry thoroughly. Apply filter sealing.

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Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Special:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

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To be distributed in accordance with DA Form 12-25, Section III, (qty rqr block no. 542) organizational maintenance requirements for Air Conditioners: 18,000 BTU compact.

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B1	Compressor, Rotary	L2	Valve, Solenoid, Pressure Equalizer
B2	Motor, Fan	P1	Connector, Plug, Power Input
CB1	Circuit Breaker, B1	P2	Connector, Plug, JB
CR1	Rectifier	P3	Connector, Plug, JB
CR2	Diode	P4	Connector, Plug, B1
E1	Terminal Stud, J B GRD	P5	Connector, Plug, L1
E2	Terminal Stud, Control Panel GRD	P6	Connector, Plug, L2
E3	Terminal Stud, System GRD	P7	Connector, Plug, Control Panel
HE-6	Heater Element	P8	Connector, Plug, Heater
J1	Connector, Receptacle, Power In	P9	Connector, Plug, B2
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J3	Connector, Receptacle, JB	S2	Thermostat
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J9	Connector, Receptacle, B2	S8	Switch, Toggle, B2
K1	Relay, Compressor Start	T1	Transformer
K2	Relay, Heater	TB1	Terminal Board, JB
K3	Relay, Time Delay	TB2	Terminal Board, JB
K4-K5	Relay, Control B2	XF1	Fuseholder
K6	Relay, Phase Sequence	XF2	Fuseholder
L1	Valve, Solenoid, B1 Bypass	Z1	RFI Filter

